SCHOOL OF ENGINEERING AND TECHNOLOGY
SRI PADMAVATI MAHILA VISVAVIDYALAYAM
(Women's University)
TIRUPATI – 517 502, ANDHRA PRADESH

Accredited by NAAC with "A" Grade

B.TECH - SCHEME AND SYLLABUS – R19

Department of Computer Science and Engineering
Effective from 2019-20 under CBCS

SCHEME OF EVALUATION

SCHOOL OF ENGINEERING AND TECHNOLOGY
SRI PADMAVATI MAHILA VISVAVIDYALAYAM
SCHEME OF INSTRUCTION AND EVALUATION OF B.TECH (CSE)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
I YEAR – I SEMESTER (2019-20)

THEORY

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal (30 Marks)			External (70 Marks)		
							Assignment	Test				
			L	T	P		Max. Marks	Duration	Max.	Duration	Max.	
1	19BST04	Engineering Mathematics – 1	3	1	0	4	5	2	25	3	70	100
2	19BST03	Engineering Physics	3	1	0	4	5	2	25	3	70	100
3	19BST01	Functional English	3	0	0	3	5	2	25	3	70	100
4	19ECT01	Basic Electronics Engineering	2	1	0	3	5	2	25	3	70	100

PRACTICALS

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal (40 Marks)			External (60 Marks)		
							Continuous	Test				
			L	T	P		Max. Marks	Duration	Max.	Duration	Max.	
5	19BSP03	Engineering Physics Lab	0	0	2	1	20	2	20	3	60	100
6	19BSP01	Communicative English Lab	0	0	2	1	20	2	20	3	60	100
7	19MEP03	Workshop and Manufacturing Practices Lab	0	0	4	2	20	2	20	3	60	100
8	19ECP01	Basic Electronics Engineering Lab	0	0	2	1	20	2	20	3	60	100
		Total	**11**	**3**	**10**	**19**						**800**

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SCHEME OF INSTRUCTION AND EVALUATION OF B.TECH (CSE)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
I YEAR – II SEMESTER(2019-20)

THEORY												
S.No	**Course Code**	**Course Title**	**Hours per Week**			**Credits**	**Evaluation**					**Total Marks**
							Internal (30 Marks)			**External (70 Marks)**		
							Assignment	**Test**				
			L	**T**	**P**		**Max. Marks**	**Duration**	**Max.**	**Duration**	**Max.**	
1	19BST05	Engineering Mathematics – II	3	1	0	4	5	2	25	3	70	100
2	19BST02	Engineering Chemistry	3	1	0	4	5	2	25	3	70	100
3	19CST01	Programming for Problem Solving	2	1	0	3	5	2	25	3	70	100
4	19EET01	Basic Electrical Engineering	2	1	0	3	5	2	25	3	70	100
5	19BST13	Essence of Indian Knowledge Tradition	3	0	0	**Satisfactory / Not Satisfactory**						
PRACTICALS												
S.No	**Course Code**	**Course Title**	**Hours per Week**			**Credits**	**Evaluation**					**Total Marks**
							Internal (40 Marks)			**External (60 Marks)**		
							Continuous	**Test**				
			L	**T**	**P**		**Max. Marks**	**Duration**	**Max.**	**Duration**	**Max.**	
6	19BSP02	Engineering Chemistry Lab	0	0	2	1	20	2	20	3	60	100
7	19CSP01	Programming for Problem Solving Lab	0	0	4	2	20	2	20	3	60	100
8	19EEP01	Basic Electrical Engineering Lab	0	0	2	1	20	2	20	3	60	100
9	19MEP01	Engineering Graphics Lab	0	0	6	3	20	2	20	3	60	100
		Total	**13**	**4**	**14**	**21**						**800**

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SCHEME OF INSTRUCTION AND EVALUATION OF B.TECH (CSE)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
II YEAR – I SEMESTER(2019-20)

THEORY												
S.No	**Course Code**	**Course Title**	**Hours per Week**			**Credits**	**Evaluation**					**Total Marks**
							Internal (30 Marks)			**External (70 Marks)**		
							Assignment	**Test**				
			L	**T**	**P**		**Max. Marks**	**Duration**	**Max.**	**Duration**	**Max.**	
1	19BST08	Economics and Accountancy	3	1	0	4	5	2	25	3	70	100
2	19ECT32	Digital Logic Design	2	1	0	3	5	2	25	3	70	100
3	19MET16	Operations Research	3	1	0	4	5	2	25	3	70	100
4	19CST02	Discrete Mathematics	2	1	0	3	5	2	25	3	70	100
5	19CST03	Data Structures	2	1	0	3	5	2	25	3	70	100
6	19CST04	Data Communications	3	0	0	3	5	2	25	3	70	100
PRACTICALS												
S.No	**Course Code**	**Course Title**	**Hours per Week**			**Credits**	**Evaluation**					**Total Marks**
							Internal (40 Marks)			**External (60 Marks)**		
							Continuous	**Test**				
			L	**T**	**P**		**Max. Marks**	**Duration**	**Max.**	**Duration**	**Max.**	
7	19ECP12	Digital Logic Design Lab	0	0	2	1	20	2	20	3	60	100
8	19CSP02	Data structures Lab	0	0	2	1	20	2	20	3	60	100
9	19CSP03	IT Workshop	0	0	2	1	20	2	20	3	60	100
		Total	**15**	**5**	**6**	**23**						**900**

SCHOOL OF ENGINEERING AND TECHNOLOGY
SRI PADMAVATI MAHILA VISVAVIDYALAYAM SCHEME
OF INSTRUCTION AND EVALUATION OF B.TECH (CSE)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
II YEAR – II SEMESTER (2019-20)

THEORY

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal (30 Marks)			External (70 Marks)		
							Assignment	Test				
			L	T	P		Max. Marks	Duration	Max.	Duration	Max.	
1	19BST07	Probability and Statistics	2	1	0	3	5	2	25	3	70	100
2	19BST09	Industrial Management	3	0	0	3	5	2	25	3	70	100
3	19CST05	Computer Architecture and Organization	2	1	0	3	5	2	25	3	70	100
4	19CST06	Object Oriented Programming	2	1	0	3	5	2	25	3	70	100
5	19CST07	Database Management Systems	2	1	0	3	5	2	25	3	70	100
6	19CST08	Theory of Computation	2	1	0	3	5	2	25	3	70	100
7	19BST12	Environmental Studies	3	0	0	0	**Satisfactory / Not Satisfactory**					

PRACTICALS

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal (40 Marks)			External (60 Marks)		
							Continuous	Test				
			L	T	P		Max. Marks	Duration	Max.	Duration	Max.	
8	19CSP04	Object Oriented Programming Lab	0	0	2	1	20	2	20	3	60	100
9	19CSP05	Database Management Systems Lab	0	0	2	1	20	2	20	3	60	100
10	19CSP06	Mathematical Tool Kit Lab	0	0	2	1	20	2	20	3	60	100
		Total	**16**	**5**	**6**	**21**						**900**

SCHOOL OF ENGINEERING AND TECHNOLOGY
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SCHEME OF INSTRUCTION AND EVALUATION OF B.TECH (CSE)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
III YEAR – I SEMESTER(2019-20)

I
II

THEORY

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal (30 Marks)			External (70 Marks)		
							Assignment	Test				
			L	T	P		Max. Marks	Duration	Max.	Duration	Max.	
1	19BST10	Entrepreneurship and Project Management	3	0	0	3	5	2	25	3	70	100
2	19CST09	Design and Analysis of Algorithms	2	1	0	3	5	2	25	3	70	100
3	19CST10	Operating Systems	2	1	0	3	5	2	25	3	70	100
4	19CST11	Compiler Design	2	1	0	3	5	2	25	3	70	100
5	19CST12	Software Engineering	3	0	0	3	5	2	25	3	70	100
6		Elective – I	2	1	0	3	5	2	25	3	70	100
7	19BST11	Constitution of India	3	0	0	0	**Satisfactory / Not Satisfactory**					

PRACTICALS

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal (40 Marks)			External (60 Marks)		
							Continuous	Test				
			L	T	P		Max. Marks	Duration	Max.	Duration	Max.	
8	19CSP07	Operating Systems Lab	0	0	2	1	20	2	20	3	60	100
9	19CSP08	Software Engineering and Object Oriented Analysis and Design Lab	0	0	2	1	20	2	20	3	60	100
		Total	**17**	**4**	**4**	**20**						**800**

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SRI PADMAVATI MAHILA VISVAVIDYALAYAM
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
III YEAR – II SEMESTER(2019-20)

THEORY												
S.No	**Course Code**	**Course Title**	**Hours per Week**			**Credits**	**Evaluation**					**Total Marks**
							Internal (30 Marks)			**External (70 Marks)**		
							Assignment	**Test**				
			L	**T**	**P**		**Max. Marks**	**Duration**	**Max.**	**Duration**	**Max.**	
1	19CST13	Machine Learning	2	1	0	3	5	2	25	3	70	100
2	19CST14	Computer Networks	2	1	0	3	5	2	25	3	70	100
3	19CST15	Artificial Intelligence	2	1	0	3	5	2	25	3	70	100
4		Elective – II	2	1	0	3	5	2	25	3	70	100
5		Elective – III	2	1	0	3	5	2	25	3	70	100
6		Open Elective – I	3	0	0	3	5	2	25	3	70	100
PRACTICALS												
S.No	**Course Code**	**Course Title**	**Hours per Week**			**Credits**	**Evaluation**					**Total Marks**
							Internal (40 Marks)			**External (60 Marks)**		
							Continuous	**Test**				
			L	**T**	**P**		**Max. Marks**	**Duration**	**Max.**	**Duration**	**Max.**	
7	19CSP09	Machine Learning and Artificial Intelligence Lab	0	0	2	1	20	2	20	3	60	100
8	19CSP10	Computer Networks Lab	0	0	2	1	20	2	20	3	60	100
		Total	**13**	**5**	**4**	**20**						**800**

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SCHEME OF INSTRUCTION AND EVALUATION OF B.TECH (CSE)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
IV YEAR – I SEMESTER(2019-20)

THEORY												
S.No	**Course Code**	**Course Title**	**Hours per Week**			**Credits**	**Evaluation**					**Total Marks**
							Internal (30 Marks)			**External (70 Marks)**		
							Assignment	**Test**				
			L	**T**	**P**		**Max. Marks**	**Duration**	**Max.**	**Duration**	**Max.**	
1	19CST16	Cryptography and Network Security	2	1	0	3	5	2	25	3	70	100
2	19CST17	Internet and Web Programming	2	1	0	3	5	2	25	3	70	100
3	19CSM01	Elective – IV (Mandatory MOOCs)	0	0	0	3	0	0	0	0	0	0
4		Open Elective – II	3	0	0	3	5	2	25	3	70	100
PRACTICALS												
S.No	**Course Code**	**Course Title**	**Hours per Week**			**Credits**	**Evaluation**					**Total Marks**
							Internal (40 Marks)			**External (60 Marks)**		
							Continuous	**Test**				
			L	**T**	**P**		**Max. Marks**	**Duration**	**Max.**	**Duration**	**Max.**	
5	19CSP11	Cryptography and Network Security Lab	0	0	2	1	20	2	20	3	60	100
6	19CSP12	Internet and Web Programming Lab	0	0	2	1	20	2	20	3	60	100
7	19CSI01	Internship	0	0	0	2	100	0	0	0	0	100
8	19CSS01	Technical Seminar	0	0	2	1	100	0	0	0	0	100
9	19CSJ01	Project Work Phase – I	0	0	4	2	100	0	0	0	0	100
		Total	**7**	**2**	**10**	**19**						**800**

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SCHEME OF INSTRUCTION AND EVALUATION OF B.TECH (CSE)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
IV YEAR – II SEMESTER (2019-20)

THEORY

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal (30 Marks)			External (70 Marks)		
							Assignment	Test				
			L	T	P		Max. Marks	Duration	Max.	Duration	Max.	
1		Elective – V	2	1	0	3	5	2	25	3	70	100
2		Elective – VI	2	1	0	3	5	2	25	3	70	100
3		Open Elective – III	3	0	0	3	5	2	25	3	70	100

PRACTICALS

S.No	Course Code	Course Title	Hours per Week			Credits	Evaluation					Total Marks
							Internal (40 Marks)			External (60 Marks)		
							Continuous	Internal Exam				
			L	T	P		Max. Marks	Duration	Max.	Duration	Max.	
4	19CSJ02	Project Work Phase – II	0	0	16	8	40	0	0	0	60	100
		Total	**7**	**2**	**16**	**17**						**400**

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LIST OF ELECTIVES (2019-20)

ELECTIVE – I

S. No	Course Code	Course Title
1	19CST18	System Programming
2	19CST19	Software Project Management
3	19CST20	Neural Networks

ELECTIVE – II

S. No	Course Code	Course Title
1	19CST21	Software Testing
2	19CST22	Data Mining
3	19CST23	Deep Learning

ELECTIVE – III

S. No	Course Code	Course Title
1	19CST24	Cloud Computing
2	19CST25	Distributed Computing
3	19CST26	Big Data Analytics

ELECTIVE – IV

S. No	Course Code	Course Title
1	19CSM01	Mandatory MOOCs

ELECTIVE – V

S. No	Course Code	Course Title
1	19CST27	Wireless Networks
2	19CST28	Information Security
3	19CST29	Data Science

ELECTIVE – VI

S. No	Course Code	Course Title
1	19CST30	Cyber Physical Systems
2	19CST31	Fault Tolerant Computing
3	19CST32	Speech and Natural Language Processing

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

LIST OF OPEN ELECTIVES OFFERED BY CSE TO OTHER DEPARTMENTS (2019-20)

OPEN ELECTIVE – I

S. No	Course Code	Course Title
1	19CST33	Basics of Data Structures
2	19CST34	Introduction to C++ Programming
3	19CSP13	Advanced Programming Lab
4	19CST35	Fundamentals of Computer Organization

OPEN ELECTIVE – II

S. No	Course Code	Course Title
1	19CST36	Basics of Computer Networks
2	19CST37	Introduction to programming withPython
3	19CST38	Introduction to Database Management Systems
4	19CST39	Introduction to Cloud Computing

OPEN ELECTIVE – III

S. No	Course Code	Course Title
1	19CST40	Introduction to Cyber Security
2	19CST41	Introduction to Artificial Intelligence
3	19CST42	Introduction to Java Programming
4	19CST43	Fundamentals of Internet of Things

SCHOOL OF ENGINEERING AND TECHNOLOGY SRI
PADMAVATI MAHILA VISVAVIDYALAYAM
SCHEME OF INSTRUCTION AND EVALUATION OF B.TECH (CSE)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
LIST OF OPEN ELECTIVES OFFERED BY OTHER DEPARTMENTS TO CSE (2019-20)

OPEN ELECTIVE–I

S.No	Course Code	Course Title	Offering Department
1	19ECT33	Pulse and Digital Circuits	ECE
2	19ECT34	Electronic Measurements	
3	19EET31	Electrical Engineering Materials	EEE
4	19EET32	Energy Auditing & Demand Side Management	
5	19MEP13	Engineering Projects in Community Services (Project based)	ME
6	19MET36	Time and Motion Study	
7	19MET37	Nano Technology	
8	19MUP01	Music Vocal	BS&H
9	19MUP02	Dance Bharatanatyam	
10	19MUP03	Dance Kuchipudi	

OPEN ELECTIVE – II

S.No	Course Code	Course Title	Offering Department
1	19ECT35	Communication Systems	ECE
2	19ECT36	Microprocessors & Interfacing	
3	19ECT37	Digital Design using VHDL	
4	19EET33	Artificial Neural Networks	EEE
5	19EET34	Energy Storage Systems	
6	19MET39	Power Plant Engineering	ME
7	19MET40	Plant Layout and Design	
9	19BST14	LSRW Skills	BS&H

OPEN ELECTIVE – III

S.No	Course Code	Course Title	Offering Department
1	19ECT38	Microcontrollers & Interfacing	ECE
2	19ECT39	Basics of Embedded Systems	
3	19ECT40	Digital Image Processing	
4	19EET35	Conventional & Non-Conventional Energy Sources	EEE
5	19EET36	Design Costing of Electrical System	
6	19MET41	Total Quality Management	ME
7	19MET42	Production Planning & Control	
8	19MET43	Supply Chain Management	
9	19BST15	Data Analytics for Decision Making	BS&H

Syllabus

B.Tech
I Year I Semester

B.Tech I Year I Semester

S.No	Course Code	Course Title
1	19BST04	Engineering Mathematics – 1
2	19BST03	Engineering Physics
3	19BST01	Functional English
4	19ECT01	Basic Electronics Engineering
5	19BSP03	Engineering Physics Lab
6	19BSP01	Communicative English Lab
7	19MEP03	Workshop and Manufacturing Practices Lab
8	19ECP01	Basic Electronics Engineering Lab

19BST04: ENGINEERING MATHEMATICS – I

Credits - 4 **Sessional Marks: 30**
L: T: P:: 3:1:0 **University Exam Marks: 70**

Course Objectives

1. To introduce the mean value theorems and the fallouts of Rolle's Theorem that is fundamental to application of analysis to engineering problems.
2. To familiarize the students with techniques in integral calculus and introduce the idea of applying integral calculus to notations of curvature.
3. To acquaint the student with different effective mathematical tools for the solutions of differential equations that model physical processes.
4. To equip the students with standard concepts in vector calculus and its applications.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Identify the extrema of a function on an interval and classify them as maxima, minima or saddle using the first derivative test.

CO2. Calculate double and triple integrals and apply to measure the area of a plane and volume of a solid.

CO3. Use the tools of Calculus to sketch the graphs of functions, Critical points, intercepts, Asymptotes etc.

CO4. Solve second and higher order linear differential equations with constant coefficients.

CO5. Analyze the methods for finding the solutions of linear differential equations.

CO6. Memorize definitions of Curl, Gradient and Divergence of vector field and compute them.

CO7. Understand the statements of Stoke's, Green's and Divergence theorem and apply them in solving Engineering problems.

UNIT I

Calculus: Roll's and Mean value theorems, Taylor's theorem, Maclaurins theorem - Maxima & minima for functions of two variables – Curve tracing.

UNIT II

Multiple integrals: Doubleand triple integrals,Change of order of integration, Change of variables – Simple applications – areas & volumes.

UNIT III

Differential Equations-I: Exact, Linear and Bernoulli's equations, orthogonal trajectories; Homogeneous and Non-Homogeneous linear differential equations of second and higher order with constant coefficients.

UNIT IV

Differential Equations-II: Linear equations with variable coefficients-Euler equations, Method of variation of parameters, Simultaneous equations.

UNIT V

Vector Calculus: Gradient, Divergence, Curl and related properties; Line, surface and volume integrals; Stokes, Greens and Gauss-Divergence theorems.

Text books

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

Reference Books

1. T.K.V.Iyengar&B.Krishna Gandhi et.,"Engineering Mathematics – I, II ";S. Chand &Company.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	H		L										M	
CO2	H	M		L											H
CO3	H	H	M	L											M
CO4	H	M	L												L
CO5	H	M			L									M	
CO6	M	H			L										M
CO7	M	H			L									M	

19BST03: ENGINEERING PHYSICS

Credits – 4 **Sessional Marks: 30**
L:T:P::3:1: 0 **University Exam Marks: 70**

Course Objectives

1. To understand this course is at the end of the course the students would be exposed to fundamental knowledge in various engineering subjects and applications.
2. To know the acquaintance of basic physics principles would help engineers to understand the vital role played by science and engineering in the development of new technologies.
3. To Familiarize basic concepts of quantum mechanics, semiconductors and superconductors will lead the students to solve some basic problems in the higher levels of their respective courses.
4. To Gain Knowledge of upcoming technologies like laser technology, fiber optics and Nanotechnology.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Explain the basic concepts of Quantum Mechanics and the band theory of solids.

CO2.Learn and to apply the basic concepts of properties of matter in day to day life.

CO3. Learn the types of Semiconductors and the role of carrier concentrations in conductivity. Understand the behaviour of materials at low temperatures and the applications of Super conductivity.

CO4. Understand the use of lasers in Engineering Science, Medicines & apply the concepts of optical fibre in communication systems.

CO5.Get a basic understanding of Nanotechnology.The course willgive idea of synthesis, characterisation of Nano materials and electrical & optical properties, applications of Nano systems.

UNIT I

Quantum Mechanics and Conducting Material: Introduction-wave nature of particles-De-Broglie Hypothesis-Time dependent and independent Schrodinger wave equation-Physical signification of wave function-particle in one dimensional infinite potential well-Heisenberg Uncertainty principle-Classical free electron theory-quantum free electron theory-Fermi Dirac Distribution.

UNIT II

Properties of Matter: Elasticity– Stress-strain diagram and its uses - factors affecting elastic Modulus and tensile strength – Torsion stress and deformations– twisting couple - torsion pendulum :theory and experiment -bending of beams- bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT III

Semiconductors and Superconductors: Semiconductors: Semiconducting materials: Intrinsic and extrinsic semiconductors – carrier concentration derivation – Fermi level – variation of Fermi level with temperature in intrinsic – electrical conductivity for intrinsic semiconductor –Hall Effect.

Superconductivity: Introduction - effect of magnetic field- Meissner effect- Types of superconductors - Flux quantization - Magnetic Levitation - BCS theory - Josephson Effect - Application of superconductors.

UNIT IV

Laser& Fiber Optics: Lasers: Einstein's theory of matter radiation interaction and A and B coefficients; Amplification of light by population inversion, different types of lasers: He-Ne Gas Laser, Ruby Laser –

Coherence -applications in engineering science and medicine.

Fiber Optics: Light propagation through fibers –Acceptance angle – numerical aperture – types of fibers – step index, graded index – single mode, multimode – attenuation – dispersion– LED-Detector- application of fiber optics in communication

UNIT V

Nanotechnology: Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-gel, Precipitation, Combustion Methods; Top-down Fabrication: Chemical Vapour Deposition, Physical Vapour Deposition, Pulsed Laser Vapour Deposition Methods, Characterization(TEM)-Carbon Nan tubes (OD,1D,2D and 3D) – Applications.

Text Books

1. Avadhanulu M. N., "Engineering Physics", S. Chand & Co., 2007
2. K.Thiyagarajan,"Engineering Physics" McGraw Hill Education (India) Private Limited.

Reference Books

1. Gaur R K, Gupta S L, "Engineering Physics", DhanpatRai Publications, 2013.
2. R.Murugesan, KiruthigaSivaprasath,"Modern Physics"S.Chand&CompanyPvt.Ltd, 2014.
3. Pillai, S.O., "Solid State Physics", New Age International Publication, New Delhi, Seventh Edition, 2015.

Course Outcomes – Program Outcomes- Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M													M
CO2			H		M										H
CO3			M			H	L						L		H
CO4					H					H					M
CO5				H			M				H			L	

19BST01: FUNCTIONAL ENGLISH

Credits – 3 **Sessional Marks: 30**
L:T:P::3:0: 0 **University Exam Marks: 70**

Course Objectives

1. To develop the knowledge of communicative grammar, enhance lexical capabilities by extensive practice exercises, build the vocabulary, and develop skimming and scanning skills using reading materials on different topics.
2. To enhance professional competence in reading, writing, listening and speaking.
3. To switch the approach from providing information about the language to use the language.
4. To minimize the Grammar Translation Method of ELT while trying to replace it with Direct Method.
5. To introduce Communicative Method of ELT and focusing the teaching pedagogy on the student-centered learning rather than on the teacher-centered learning.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Analyze the usage of English words in different contexts and acquire considerable flair in using broad range of vocabulary.

CO2. Upgrade comprehension of technical and academic articles and recognize writings as a process rather than a product.

CO3. Identify common errors in various parts of English and give effective expression in oral and written communication.

CO4. Explore various grammatical units of English and design a language component critically and coherently to meet desired needs within the realistic constraints.

UNIT I

The Secret of Work by Swami Vivekananda: Vocabulary Building: Root words from foreign languages and their use in English;Writing: Tenses; Identifying Common Errors: Subject-Verb agreement; Reading Comprehension.

UNIT II

Reaching for the Stars: KalpanaChawla: Vocabulary Building: Word Formation; Writing: Sentence Structures, Use of phrases and clauses in sentences; Identifying Common Errors: Noun-Pronoun Agreement; Reading Comprehension.

UNIT III

A Retrieved Reformation by O. Henry: Vocabulary Building: Acquaintance with prefix and suffix from foreign languages in English to form derivatives; Writing: Importance of proper punctuation, Creating Coherence, Describing; Identifying Common Errors: Misplaced Modifiers; Reading Comprehension.

UNIT IV

Water: The Elixir of Life by C.V. Raman: Vocabulary Building: Synonyms and antonyms; Writing: Paragraph writing, Précis Writing;Identifying Common Errors: Articles, Prepositions; Reading Comprehension.

UNIT V

The Post Office by Rabindranath Tagore: Vocabulary Building: Standard Abbreviations; Writing: Letter Writing; Identifying Common Errors: Use of Adjectives; Reading Comprehension.

Reference Books

1. MichaelSwan,"Practical English Usage", OUP. 1995.
2. F.T.Wood, "Remedial English Grammar", Macmillan. 2007.
3. WilliamZinsser,"On Writing Well", Harper Resource Book. 2001.
4. Liz Hamp-Lyons and Ben Heasly. "Study Writing", Cambridge University Press. 2006.
5. Sanjay Kumar and PushpLata. "Communication Skills", Oxford University Press. 2011.

Course Outcomes – Program Outcomes- Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		H								M		L		M	
CO2				M						H		M		L	
CO3									M	H		L			M
CO4				M						H		M		M	

19ECT01: BASIC ELECTRONICS ENGINEERING

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

1. ToKnowthevolt-Amperecharacteristicsofsemiconductordevices.
2. To Gain knowledge on various TransistorAmplifiers.
3. ToKnow the principle of operation of FET biasing schemes and Amplifiers.
4. To Familiarize with negative feedback Amplifiers andoscillators.
5. To Implement different op-Ampcircuits.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Learn PN-Diode, Transistor, FET, Amplifiers, Oscillators, IC's.

CO2. Solve problems related to Rectifiers, Transistor Amplifiers, negative feedback amplifiers,Inverting and non-inverting Op-Ampcircuits.

CO3. Classify Rectifiers,BJT and FET Amplifiers, Oscillators.

CO4. Analyze the biasing schemes of Transistors, FET's, rectifiers and Amplifiers.

CO5.Apply rectifiers, BJT Amplifiers, FET amplifier, negativeFeedbackAmplifiers,oscillators, OP-Amps for electronic systems.

UNIT I

PN Junction Diode: Semiconductor materials, PN junction diode, Volt-ampere characteristic and applications,Half wave rectifier, Full wave rectifier, Bridge rectifier, Filters.

UNIT II

Bipolar Junction Transistor: Construction, characteristics and parameters, Transistor as amplifier, Biasing, CB,CE,CC amplifiers and their comparison.

UNIT III

Field Effect Transistor: Construction, characteristics and parameters of JFET,depletion and enhancement type MOSFETS, Biasing, JFET amplifiers, CS,CD and CG amplifiers and their comparison.

UNIT IV

Feedback Amplifiers and Oscillators: Concept of Feedback, advantages of Negative Feedback, types of feedback circuits, BarkHausen criterion, RC phase shift and wein bridge oscillators, Hartley andColpitts oscillators.

UNIT V

Integrated Circuit Applications: Op-Amp applications, inverting and Non-inverting amplifiers, comparator, Summer, Integrator, Astable and MonostableMulti-vibrators.

Text Books

1. J.Milliman and C.C.Halkias, Satyabratajit, "Integrated Electronics", 2nd edition, TMH,1998.
2. Allen Mottershead, "Electronic Devices and Circuits", PHI Private Limited,1979.

Reference Books

1. RobertL.Boylestad,LouisNashelsky-"ElectronicDevicesandCircuitTheory",9thEdition,2008.

2. S.Salivahana, N.Suresh Kumar, A.Vallavaraj- "Electronic Devices and Circuits",2nd

Course Outcomes – Program Outcomes – Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-										H		
CO2		H	M	L					L	L	L		H	M	
CO3	H	M											H		
CO4	H	M	L	L										L	H
CO5			H	M		M	L		L	L	L	L		L	H

19BSP03: ENGINEERING PHYSICS LAB

Credits -1 **Sessional Marks: 40**
L:T:P::0:0: 2 **University Exam Marks: 60**

Course Objectives

1. To impart practical knowledge about some practical phenomena they have studied in the engineering physics course.
2. To develop the experimental skills of the students.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Apply knowledge of mathematics and physics fundamentals and an Instrumentation to arrive solution for various problems.

CO2. Understand the usage of basic laws and theories to determine various properties of the materials given.

CO3. Apply the theories learnt and the skills acquired to solve real time problems.

CO4. Carryout experiments to understand the laws and concepts of physics.

LIST OF EXPERIMENTS
(Minimum Six are mandatory)

1. Determination of Numerical aperture and bending losses of fibers of an optical fiber.
2. Young's modulus - non uniform bending – Pin and microscope
3. Calibration of voltmeter / ammeter using potentiometer
4. Spectrometer-Dispersive power of prism /grating.
5. Spectrometer- Determination of refractive index of given liquid using Hollow Prism.
6. Laser-Determination of wavelength.
7. Air Wedge- Determination of thickness of given thin wire.
8. V-I Characteristics of PN Junction diode.
9. Energy Gap Determination of a PN Junction Diode
10. Determination of surface tension of the given liquid-drop weight method.

Course Outcomes – Program Outcomes – Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H														H
CO2		H													M
CO3			H												M
CO4	H				H					H					H

19BSP01: COMMUNICATIVE ENGLISH LAB

Credits -1 **Sessional Marks: 40**
L:T:P::0:0: 2 **University Exam Marks: 60**

Course Objectives

1. To enhance communicative skills of the students with emphasis on Listening, Speaking, Reading and Writing skills.
2. To develop oral communication and fluency in Group Discussions, Just a Minute and Debates.
3. To enable the student to acquire the structure of written expressions required for their profession.
4. To enable the student to communicate in English for Academic and Social purpose.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Learn English speech sounds, analyze phonetic transcriptions
CO2. Understand the stress on word accent, intonation, and rhythm to acquire better pronunciation.
CO3. Acquire fluency in spoken English and neutralize mother tongue influence.
CO4. Upgrade listening skills and receive and interpret messages in the communication process.
CO5. Become active participants in the learning process and acquire proficiency in both ways of communication

UNIT I

Phonetics

i) Phonetics: Importance ii) Speech Sounds - Vowels and Consonants
iii) Phonetic Transcriptions

UNIT II

Pronunciation:i) Word Stress and Rhythm ii) Intonation: Rising tone, Falling tone.

UNIT III

Oral Communication:i) Group Discussions ii) Just a minute (JAM) iii) Debate iv) Situational Dialoguesv) Oral Presentation s

UNIT IV

Listening Skills

` **UNIT V**

Resume Writing, Interview Skills

Reference Books

1. NiraKonar,"English Language Laboratories: A Comprehensive Manual". PHI Learning Pvt. Ltd., 2011.
2. MichaelSwan,"Practical English Usage", OUP. 1995.
3. WilliamZinsser,"On Writing Well", Harper Resource Book. 2001.
4. Liz Hamp-Lyons and Ben Heasly. "Study Writing, Cambridge University Press. 2006.
5. Sanjay Kumar and PushpLata. "Communication Skills", Oxford University Press. 2011.
6. Central institute of English & Foreign Languages. "Exercises in Spoken English. Parts. I-III", Hyderabad. Oxford University Press.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		**H**		**M**						**L**				**M**	
CO2		**L**		**M**						**H**				**L**	
CO3				**M**						**H**				**M**	
CO4		**M**								**H**					**M**
CO5				**L**						**H**		**M**			**H**

19MEP03: WORKSHOP AND MANUFACTURING PRACTICES

(Common for all Branches)

Credits – 2 **Sessional Marks: 40**

L:T:P ::0:0:4 **University Exam Marks: 60**

Course Objectives

To expose the students to the following

1. Understand the basic knowledge of Workshop Practice and Safety.
2. Identify and use of different hand tools and other instruments like Hand Saw, Jack Plane, Chisels etc and operations like such as Marking, Cutting etc used in manufacturing processes.
3. Get hands on practice in various machining metal joining processes such as turning, facing,fitting , Soldering, etc.
4. Gain basic knowledge on Computer hardware and Software.

Course Outcomes

After successful completion of course the student should be able to

CO1. Gain basic knowledge of Workshop Practice and Safety useful for our daily living.

CO2.Identify Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc and Performing Operations such as Marking, Cutting etc used in manufacturing.

CO3.Gain knowledge of the various operations in the Fitting Shop using Hack Saw, various files, Scriber etc., to understand the concept of tolerances applicable in all kind of manufacturing.

CO4.Known and identify the computer hardware,assembly and disassemble the CPU.

CO5.Obtain the knowledge toinstallation of software's for different applications.

TRADE 1: CARPENTARY

Wood sizing exercise in planning, marking, sawing, chiseling and grooving to prepare

1. Cross Lap Joint.
2. Bridle Tee Joint.

TRADE 2: FITTING

Marking, cutting and filing to practice

1. Square Fitting.
2. V Fitting.

TRADE 3: ELECTRICAL & ELECTRONICS

Safety rules and practices in wiring, basic circuits common house wiring connections such as

1. Identification of basic electrical and electronic components.
2. (a) Two-switches, two-bulbsinparallel connection.
   (b)Staircase connection.
3. Soldering process.

TRADE 4: MANUFACTURING PRACTICE ON LATHE

1. Facing operation
2. Straight turning and Chamfering.

TRADE 5: INFORMATION TECHNOLOGY

1. Assembly and disassembly of CPU and component identification.
2. Software installation.

Reference Books

1. K. Venkat Reddy, Workshop Manual, BS Publications
2. P.Kannaiah, K.L.Narayana-Work shop Manual -SciTech Publishers.
3. Jeyapoovan, SaravanaPandian-Engineering Practices Lab Manual -Vikas publishers

Course Outcomes - Program Outcomes - Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**H**				**M**			**L**		**M**			**H**	**M**	
CO2	**H**	**H**	**L**							**M**			**H**	**M**	
CO3	**H**					**M**				**M**		**L**	**M**	**M**	
CO4	**L**	**M**			**H**					**M**			**H**	**M**	
CO5	**H**				**L**	**M**				**M**			**H**	**M**	

19ECP01: BASIC ELECTRONICS ENGINEERING LAB

Credits–1 **Sessional Marks:40**
L: T:P::0:0:2 **University ExamMarks:60**

Course Objectives

1. To provide Engineering skills by way of breadboard circuits with electronic devices and components.
2. To test and experimentally determine characteristics of electronic devices such as FET, PN diode, BJT &JFET.
3. ToconstructandmeasuredifferentparametersofRectifiers,AmplifiersandOPAmps.

Course Outcomes

After successful completion of the course the student should be able to
CO1. Plot the characteristics of electronic devices and determine their parameters.
CO2. Construct and test amplifiers, Rectifiers and oscillators.
CO3. Operate electronic test equipment.
CO4. Verify experimentally determined values with theoretical values.
CO5. Identify the applications of different Electronic Devices.

LIST OF EXPERIMENTS

1. Study ofCRO.
2. PN Junction DiodeCharacteristics
3. Half Wave Rectifier with and without Cfilter
4. Full Wave Rectifier with and without LCfilter
5. Bridge Rectifier with and without πfilter
6. Input and output Characteristics of BJT in CEconfiguration
7. CEamplifier
8. FETcharacteristics
9. FeedbackAmplifiers
10. RC phase shiftOscillator
11. OP-Ampapplications
12. OP Amp Comparator and AstableMultivibrator.

Note: A Minimum of 10 experiments have to be conducted.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	H	-	-	-	-	-		L	L	L		H		
CO2			H	M					L	L	L			H	L
CO3		L	H	M					L	L	L		H	M	L
CO4		M	H						L	L	L		H		M
CO5		H	M	M					L	L	L	L	L		H

B.Tech I Year II Semester

B.Tech I Year II Semester

S.No	Course Code	Course Title
1	19BST05	Engineering Mathematics – II
2	19BST02	Engineering Chemistry
3	19CST01	Programming for Problem Solving
4	19EET01	Basic Electrical Engineering
5	19BST13	Essence of Indian Knowledge Tradition
6	19BSP02	Engineering Chemistry Lab
7	19CSP01	Programming for Problem Solving Lab
8	19EEP01	Basic Electrical Engineering Lab
9	19MEP01	Engineering Graphics

19BST05: ENGINEERING MATHEMATICS – II

Credits - 4 **Sessional Marks: 30**
L: T: P :: 3: 1: 0 **University Exam Marks: 70**

Course Objectives

1. Provides an introduction to Laplace Transforms
2. To Gain knowledge of matrices in a comprehensive manner and the convergence of series.
3. To Familiarize numerical methods for solving first-order IVPs
4. To introduce partial differential equations and make the student get acquainted with the basics of PDE.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Define Laplace transforms, Rank, Eigen Values and Eigen vectors, absolute and Conditional convergence

CO2. Understand Convolution theorem, Linear Dependence and Independence, Convergence and Divergence of sequences and series, Basic concepts of formation of Partial differential equations.

CO3. Apply Laplace transforms to solve ordinary differential equations and use appropriate numerical method to solve algebraic, Transcendental equations, ordinary differential equations.

CO4. Determine the Laplace transforms of standard functions and evaluate a definite integral numerically and demonstrate that any square matrix satisfy its characteristic polynomial and evaluate its minimal polynomial

CO5. Derive one – dimensional wave equation, Heat equation and Laplace equation

UNIT I

Laplace Transforms: Laplace transforms of standard functions, Transform of Periodic functions, Step function, Inverse transforms of derivatives and integrals, Convolution theorem, applications to solutions of ordinary differential equations.

UNIT II

Matrices: Rank, solution of system of linear equations, Eigen values, Eigen vectors, Cayley Hamilton theorem, Quadratic forms – Diagonalization.

Sequences and Series: Convergence and Divergence, Ratio test, Comparison test, Absolute and Conditional Convergence.

UNIT III

Partial Differential Equations: Formation of PDEs by elimination of arbitrary constants and arbitrary functions, Method of separation of variables, one dimensional wave equation, heat equation, Laplace equation.

UNIT IV

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation by Gauss elimination method, Gauss matrix and Gauss – Seidal iteration method.

Interpolation: Newton's forward and backward interpolation formulae – Lagrange's formulae.

UNIT V

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

Numerical solution of Ordinary Differential equations

Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method, Runge-Kutta Methods, Predictor-Corrector Method-Milne's Method.

Text books

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

Reference Books

1. T.K.V.Iyengar&B.Krishna Gandhi et.,"Engineering Mathematics –I, II"; S. Chand & Company.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M			L								**L**		
CO2	M	H			L									**M**	
CO3	H	L			M										**L**
CO4	H	M			M									**L**	
CO5	M	H			L										**M**

19BST02:ENGINEERING CHEMISTRY

Credits – 4 **Sessional Marks: 30**
L:T:P::3:1: 0 **University Exam Marks: 70**

Course Objectives

1. To impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
2. To strengthen the fundamentals of chemistry in Atomic Structure and then build an interface of theoretical concepts with the engineering applications.
3. To help students understand the fundamental concepts and achieve Advanced Knowledge about the interactions of Spectroscopy and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
4. To Implement the concepts of chemistry in respect of Electrochemical cells, Thermodynamic process, mechanism of corrosion and factors to influence, polymers with their applications and analytical methods.
5. To understand the upcoming technologies like Fullerenes, carbonnanotubes, applications of Telecommunications in Nano materials.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Explain the basic concepts of Atomic and Molecular structures and the band theory of solids.
CO2. Solve problems related to the structure , purity and to study Molecular interactions by Spectroscopic methods
CO3. Apply knowledge of Substitute metals with Conducting polymers and also produce Bio-degradable polymers to reduce Environmental Pollution
CO4. Understand the mechanism of Electro Chemical corrosion of metals ,use of appropriate design criteria and apply corrosion protection techniques.
CO5. Give idea of synthesis, characterisation of Nanomaterials and applications of latest technology on Carbon Nano wires and medicinal applications.

UNIT I

Atomic and molecular structure: Schrodinger equation. Particle in a box solutions and their applications for conjugatedmolecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots ofthese functions to explore their spatial variations.Molecular orbitals of diatomic moleculesand plots of the multicentre orbitals.Equations for atomic and molecular orbitals.Energylevel diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity.Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties.Band structure of solids and the role of doping on band structures.

UNIT II

Spectroscopic techniques, applications and Organic reactions and synthesis of a drug molecule: Principles of spectroscopy and selection rules. Electronic spectroscopy.Fluorescence and itsapplications in medicine.Vibrational and rotational spectroscopy of diatomic molecules.Applications.Nuclear magnetic resonance and magnetic resonance imaging, surfacecharacterization techniques.Diffraction and scattering.Introduction to reactions involving substitution, addition, elimination, oxidation, reduction,cyclization and ring openings. Synthesis of a commonly used drug molecule.

UNIT III

Polymers: Mechanism of polymerization and synthesis of polymers. Molecular weight, shape andconformation of polymers.Crystallinity, melting point and glass transition.Copolymerization.Viscoelasticity.Elastomers-structure, applications and curing.Conductingpolymers and applications.Dendrimers.Solubility of polymers.Fabrication and

mouldingofpolymers. Synthesis, properties and uses of PE, PVC, PMMA, formaldehyde resins,melamine-formaldehyde-urea resins. Adhesives, adhesive mechanism and applications.Composites: characteristics, types and applications. Nanocomposites.Metallic and nonmetallic fillers.

UNIT IV

Surfactants and Lubricants and Corrosion: Methods of preparation, cleaning mechanism. Critical micelle concentration and itsdetermination.Hydrophobic and hydrophilic interactions. Micelles and reverse micelles.Detergents. Fricohesity of surfactants.Lubricants-physical and chemical properties, typesand mechanism of lubrication.Additives of lubricants and freezing points of lubricants.Thermodynamic overview of electrochemical processes. Reversible and irreversible cells.Chemical and electrochemical corrosion and mechanism of corrosion. Factors affecting corrosion.Protection of corrosion and practical problems of corrosion.

UNIT V

New Materials/Nanomaterials: Nanomaterials. Properties and application of fullerenes, fullerols, carbon nanotubes andnanowires.Synthesis-top down and bottom up approaches.Nanoelectronics.Applications ofnanomaterials in catalysis, telecommunication and medicine.

Text Books

1. Jain and Jain "Engineering Chemistry",15th Edition,Dhanapatrai publishing company.
2. K.N.Jayaveera, G.V.Subba Reddy, C.Ramachandraiah."Engineering Chemistry", 1st Edition, McGraw Hill Education (India) Private Limited,2013.

Reference Books

1.Jag Mohan, "Organic Spectroscopy",2nd Edition ,Narosa Publishing house,2007.

2.V.K.Ahluwalia and RakeshkumarParashar."Organic Reaction Mechanisms",3rdEdition,Narosa Publishing House,2007.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M												L	
CO2		H	L		H									M	
CO3					M	H	H								M
CO4			H			H	L							L	
CO5					H		M			H					M

19CST01: PROGRAMMING FOR PROBLEM SOLVING

Credits–3	**Sessional Marks:30**
L:T:P::2:1:0	**University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Basic concepts ofcomputer.
2. Variables, C-Tokens and operators, functions, arrays andstrings.
3. Pointers, structures, unions andfiles.
4. Write algorithms for solving problems with help of C programmingconcepts.

Course Outcomes

After successful completion of course the student should be able to CO1.
Analyse the real time problems, develop algorithms to solve it
CO2. Use conditional branching, iteration, recursion, arrays, pointers and structures to formulate algorithms and programs in C.
CO3. Design and implement the complex problems using functions CO4.
Understanding Pointers and dynamic memory allocation CO5. Apply the
knowledge of files in different applications

UNIT I

Introduction to Problem Solving: Introduction to Computer Systems, Computer Environments, Computer Languages, Problem Solving Aspects, Top-Down Design, Bottom-Up Design, Development of Algorithms, Representation of Algorithm, Flow Chart, Pseudo Code, Coding, Testing and Debugging.

UNIT II

Introduction to C: History of C programming Language, Structure of a C program - Comments, pre- processor statements, function header statements, variable declaration statements and executable statements. C character set, C tokens-constants, identifiers, operators, punctuations and keywords. Basic data types, modifiers, identifiers, variables, C Scopes, Type qualifiers, Storage Class Specifiers, variable initializations and constants. Console I/O: Reading and writing characters, Formatted console I/O. Operators: Assignment, Arithmetic, Relational, Logical, Bitwise, Ternary, Address, Increment/Decrement, special Operators. Expressions: Precedence of operators and associativity. Category of Statements: Decision Making, Branching and Looping statements.

UNITIII

Functions: Declaration, Prototype definition, calling by value and address, Standard Library Functions, User Defined functions, RecursiveFunctions.

Arrays and strings: Declaration, Initialization, Reading and Writing, Accessing, and Passing as a parameter to functions, Types of arrays, String functions.

UNIT IV

Pointers: Pointer expressions, pointer and arrays, multiple indirection, initializing pointers, pointers to functions, Dynamic memory allocation functions.

Structures: Declaration, initialization, accessing, array of structures and passing structures to functions, structure pointers, arrays and structures within structures, Unions, Bit-fields, typedef, and enumerations.

UNIT V

Files: I/O and processing operations on Text and binary files, Pre-processor directives and Command Line Arguments.

Text Books

1. Brian W.Kernighan and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, Prentice Hall of India, 2018.

Reference Books

1. Herbert Schildt, “C: The Complete Reference”, 4th Edition, Tata McGraw-Hill,2000.

2. E Balagurusamy, “Programming in ANSI C”, 7th Edition, Tata McGraw-Hill,2016.
3. YeswanthKanitkar, “Let us C”, 9th Edition, BPB Publications,2012.

Web References

1. https://nptel.ac.in/courses/106/105/106105171/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	H	H	M	-	-	-	-	-	-	-	-	H	H	-
CO2	H	M	M	-	M	-	-	-	-	-	-	-	H	H	-
CO3	-	M	H	M	M	-	-	-	-	-	-	-	H	H	-
CO4	H	L	-	-	-	-	-	-	-	-	-	-	H	L	-
CO5	H	-	-	L	M	-	-	-	-	-	-	-	H	H	-

19EET01: BASIC ELECTRICAL ENGINEERING
(Common for CSE, ME & ECE Branches)

Credits - 3 **Sessional Marks: 30**
L: T: P:: 3:0:0 **University Exam Marks: 70**

Course Objectives
1. To impart basic knowledge of electrical quantities such as current, voltage, power and energy and analysis Techniques in electrical engineering.
2. To provide knowledge on magnetic circuits.
3. To familiarize with the ac circuits.
4. To introduce Network theorems to determine circuit response.
5. To Know the Construction and Principle of Operation of DC Generators, DC Motors, Transformers, single phase and three phase Induction motors.

Course Outcomes
After completion of the course the student will be able to
CO1. Apply the concepts of basic laws and calculate the fundamental quantities in DC circuits.
CO2. Explain the basic concepts of electromagnetism, types of induced emf, self and mutual Inductances.
CO3. Understand the basic definitions, Analyze and apply the phasor algebra approach in R, L, C series and parallel AC circuits.
CO4. Analyze the various Network theorems to determine circuit response
CO5. Describe the principle of operation, Types and construction of DC generators, DC motors, Transformers, Single & three phase induction motors.

UNIT I
DC Circuits: Active and passive elements – Ideal and practical sources –V –I Characteristics of R.L and C elements – Kirchhoff's laws, Mesh and nodal analysis – Concept of super mesh and super node.
Magnetic Circuits: Basic definitions, Analogy between electric and magnetic circuits, magnetization characteristics of ferromagnetic materials, self inductance, mutual inductance, energy in linear magnetic systems, coils connected in series attracting force of electro magnets. Concept of coupling and dot convention.

UNIT II
AC Circuits: Principle of AC voltages, wave forms and basic definitions, relationship between frequency, speed and number of poles, root mean square and average values of alternating current and voltage, form factor and peak factor, phasor representation of Alternating Quantities, the j operator and phasor algebra, analysis of AC circuits with single basic network element, single phase series circuits, single phase parallel circuits, single phase series parallel circuits, power in AC circuits.

UNIT III
Network Theorems: Super position theorem, Thevenin's& Norton's theorem, Maximum power transfer theorems, Tellegan's Theorem, Millman's Theorem and problems.

UNIT IV
Transformers:
Principle of operation, constructional details, ideal transformer, and practical transformer, losses, transformer testing, efficiency, and regulation calculations (all the above topics are elementary treatment and simple problems).
Direct Current Machines: principle of operation of DC machines, armature windings, EMF equation in DC machines, torque production in a DC machine, operation of a DC machine as a generator, operation of a DC machine as a motor , losses and efficiency.

UNIT-V
A.C Machines
Single Phase Induction Motor: principle of operation, types of single phase induction motor and working.
Three Phase Induction Motor: principle of operation, production of rotating magnetic field, slip and rotor frequency, torque (simple problems), losses and efficiency.

Text Books
1. M.S Naidu and S.Kamakshaiah, "Basic Electrical Engineering", 2nd Edition, Tata McGraw – Hill, 2008

2. T.K.Nagsarkar and M.S.Sukhija, "Basic Electrical Engineering", 2nd Edition, Oxford University press, 2017.

Reference Books

1. D.P.Kothari& I.J.Nagrath,"Theory and Problems of Basic Electrical Engineering", 2nd Edition, PHI, 2017.
2. V.K.Mehta, "Principles of Electrical Engineering" Revised Edition, S.Chand publications, 2010
3. David V.Kems, JRJ.David "Essentials of Electrical and computer engineering", United States Edition, Irwin Pearson, 2004

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**H**	**-**	**-**	**-**	**M**	**-**	**-**	**-**	**-**	**M**	**-**	**-**	**L**	**H**	**-**
CO2	**H**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**M**	**-**	**-**	**L**	**M**	**-**
CO3	**M**	**H**	**-**	**-**	**L**	**-**	**-**	**-**	**-**	**M**	**-**	**-**	**L**	**M**	**-**
CO4	**M**	**-**	**-**	**-**	**H**	**-**	**-**	**-**	**-**	**M**	**-**	**-**	**L**	**M**	**-**
CO5	**H**	**L**	**H**	**-**	**-**	**-**	**-**	**-**	**-**	**M**	**-**	**-**	**L**	**M**	**-**

19BST13: ESSENCE OF INDIAN KNOWLEDGE TRADITION

Credits – No credits
L:T:P::3:0:0

Course Objectives

1. To impart basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge systems connecting society and nature.
2. To impart holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
3. To focus on introduction to Indian knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.
4. To focuses on Indian Philosophical traditions , Indian linguistic Tradition and Indian artistic tradition.

Course Outcomes

After successful completion of course the student should be able to

CO1. The student will be able to understand, connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.

UNITI

The basic structures of Indian knowledge system: Vedas – vedangas, Upavedas – Ayurveda, Dhanurveda, Gandharvaveda, Vedic gods – Agni, Indra, Varuna, Vishnu, Importance of the study of the vedic hymns.

UNIT II

Modern sciences and Indian knowledge system: Vedic cosmology, Indian atomic theory, Matter life and Mind –Sri Aurobindo .

UNITIII

Yoga and Holistic Health Care: Mind and its Modes, Afflictions, Threefold pain, Dispositions, Levels of Attention ,

Astanga Yoga.

UNITIV

Indian Philosophical Tradition: Asatikadarshanas - Nyaya, Vaisesika, Sankhya, Yoga, Mimamsa, Vendanta. Nastikadarshanas – Carvaka, Jaina Buddhism

UNIT V

Indian Linguistic and Aristic Tradition: Phonology - (sabda), Morphology (pada), syntax (vakya), Semantics,Vakhyartha,Chitrakala, Murthikala, vasthukala

Reference Books

1. S. RadhaKrishna , Indian Philosophy ,Oxford Indian Paper backs, New Delhi.
2. V.SivaramaKrishnan (Ed.), Cultural Heritage of Indian - course material ,Bharatiya VidyaBhavan ,Mumbai. 5th Edition, 2014
3. SmamiJitatmanand , Modern Physics and Vedant , BhartiyaVidyaBhavan.
4. SmamiJitatamanad , Holistic Science and Vedant , BhartiyaVidyaBhavan.
5. Fritz of capra ,Tao of Physics.
6. Fritz of capra ,The Wave of Life
7. VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta , International Chinmay Foundation ,Velliarnad,Arnakulam .
8. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata .
9. GN Jha (Eng. Trans.), Ed. RN Jha , Yoga-darshanam with VyasaBhashya, Vidyanidhi Prakashan ,

Delhi 2016.
10. RN Jha, Science of Consciousness Psychotherapyand Yoga Practices, Vidyanidhi Prakashan ,Delhi 2016
11. PB Sharma (English translation), ShodashangHridayan .

19BSP02: ENGINEERING CHEMISTRY LAB

Credits – 1 **Sessional Mark: 40**
L:T:P::0:0: 2 **University Exam Marks: 60**

Course Objectives :

1. To impart practical knowledge about some practical phenomena they have studied in the engineering Chemistry course.
2. To develop the experimental skills of the students.

Course Outcomes
After successful completion of the course the student should be able to

CO1. Understand the estimation of the acidity of water ,Dissolved Oxygen in different water samples ,estimation of chloride content of water and some ions etc.
CO2.Analyse and to measure the conductance and redox potentials of different solutions.
CO3.Develop knowledge pertaining to the appropriate selection of instruments for the successful analysis of complex mixture.
CO4.Apply the knowledge of various aspects of synthesis of drug

LIST OF EXPERIMENTS
(Minimum Seven are mandatory)

1. To determine the strength of KMnO4 solution by titrating it against a standard solution of Oxalic acid.
2. Determination of hardness of water by EDTA method.
3. Estimation of acidity of Water.
4. Estimation of Dissolved oxygen in water sample.
5. Determination of Iron by using potassium dichromate.
6. Estimation of copper by EDTA method.
7. Estimation of chloride in water sample.
8. Conductometric titration of strong acid with strong base.
9. Potentiometric titration of Iron by dichrometry method.
10. Colorimetric estimation of manganese
11. Synthesis of a polymer/ drug.
12. Thin layer chromatography.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H													M	
CO2		H												H	
CO3					H									L	
CO4						H									M

19CSP01: PROGRAMMING FOR PROBLEM SOLVING LAB

Credits – 2 **Sessional Marks: 40**
L:T:P::0:0:4 **University Exam Marks: 60**

Course Objectives
To expose the students to the following:
1. Understand and solve logical and mathematical problems.
2. Programming methodologies using C language.

Course Outcomes
After successful completion of course the student should be able to
CO1. Formulate the algorithms for simple problems and Write iterative as well as recursive programs. CO2. Translate given algorithms to a working program and work on files.
CO3. Correct syntax errors as reported by the compilers.
CO4. Identify and correct logical errors encountered at run time.
CO5. Represent data in arrays, strings and structures and manipulate them through a program to be able to declare pointers of different types and use them in defining self-referential Structures.

List of Experiments

1. Write a C program to display "Hello Computer" on the screen.
2. Write a C program to display Your Name, Address and City in different lines.
3. Write a C program to find the area of a circle
4. Write a C program to convert centigrade into Fahrenheit. Formula: C= (F*32)/1.8.
5. Write a C program to read in a three-digit number produce following output (assuming that the input is 347) 3 hundreds 4 tens 7 units
6. Write a C program to read in two integers and display one as a percentage of the other. Typically, your output should look like 20 is 50.00% of 40 assuming that the input numbers were 20 and 40. Display the percentage correct to 2 decimal places.
7. Write a C program to swap variable values of i and j.
8. Write the program for the simple, compound interest.
9. Write a C program to find the maximum from given three nos.
10. Write a C program to find that the accepted no is Negative, Positive or Zero.
11. Write a program which reads two integer values. If the first is lesser print the message up. If the second is lesser, print the message down if they are equal, print the message equal if there is an error reading the data, print a message containing the word Error
12. Given as input three integers representing a date as day, month, year, print the number day, month and year for the next day's date. Typical input: “28 2 1992” Typical output: “Date following 28:02:1992 is 01:03:1992”
13. Write program for students marks grading.
14. Take three coefficients (a, b, and c) of a Quadratic equation ($ax^2+bx+c=0$) as input and compute all possible roots. Implement a C program to output the possible roots for a given set of coefficients with appropriate messages.
15. Implement a C program that takes an integer number as input, check whether it is PALINDROME or NOT and output the reverse of the same with suitable messages. Ex: Num: 2014, Reverse: 4102, Not a Palindrome.
16. Implement a C program to find the square root of a given number N and execute for all possible inputs with appropriate messages. Note: Don’t use library function sqrt(n).
17. Design and develop a C program to read a year as an input and find whether it is leap year or not. Also consider end of the centuries.
18. Design and develop a C function RightShift(x, n) that takes two integers x and n as input and returns value of the integer x rotated to the right by n positions. Assume the integers are unsigned. Write a C program that invokes this function with different values for x and n and tabulate the results with suitable headings.
19. Design and develop a C function isprime (num) that accepts an integer argument and returns 1 if the

argument is prime, a 0 otherwise. Write a C program that invokes this function to generate prime numbers between the given range.

20. Write a C program for the problem given below: Assume that the United States of America uses the following income tax code formula for their annual income: First US$ 5000 of income: 0% tax Next US$ 10,000 of income: 10% tax Next US$ 20,000 of income: 15% tax. An amount above US$ 35,000: 20% tax. For example, somebody earning US$ 38,000 annually would owe US$ 5000 X 0.00 + 10,000 X 0.10 + 20,000 X 0.15 + 3,000 X 0.20, which comes to US$ 4600. Write a program that uses a loop to input the income and calculate and report the owed tax amount. Make sure that your calculation is mathematically accurate and that truncation errors are eliminated.
21. Write a C program to convert decimal to binary.
22. Write a C program to convert decimal to octal.
23. Write a C program to convert decimal to hexadecimal.
24. Write a C program that reads in integers until a 0 is entered. If it encounters 0 as input, then it should display:
    a. The total number of even and odd integers
    b. Average value of even integers
    c. Average value of odd integers.

Note: Use switch statement for selection.

25. Write an interactive program to generate the divisors of a given integer.
26. Write a program to find all Armstrong number in the range of 0 and 999 Hint: An Armstrong number of three digits is an integer such that the sum of the cubes of its digits is equal to the number itself. For example, 371 is an Armstrong number since 3**3 + 7**3 + 1**3 = 371.
27. Write a program to check whether a given number is a perfect number or not. Hint: A positive integer n is called a perfect number if it is equal to the sum of all of its positive divisors, excluding n itself. For example, 6 is a perfect number, because 1, 2 and 3 are its proper positive divisors and 1 + 2 + 3 = 6. The next perfect number is 28 = 1 + 2 + 4 + 7 + 14. The next perfect numbers are 496 and 8128.
28. Write a program to check whether given two numbers are amicable numbers or not. Hint: Amicable numbers are two numbers so related that the sum of the proper divisors of the one is equal to the other, unity being considered as a proper divisor but not the number itself. Such a pair is (220,284); for the proper divisors of 220 are 1, 2, 4, 5, 10, 11, 20, 22, 44, 55 and 110, of which the sum is 284; and the proper divisors of 284 are 1, 2, 4, 71, and 142, of which the sum is 220.
29. Write a program that will take as input a set of integers and find and display the largest and the smallest values within the input data values.
30. Write a C program that uses functions to perform the following operations: i. To insert a sub-string in to a given main string from a given position. ii. To delete n Characters from a given position in a given string.
31. Write a C program to do the following computation by providing the option using the switch statement:
    a. Add two matrices
    b. Subtract two matrices
    c. Multiply two matrices
32. Write a program to check if the given matrix is magic square or not.
33. Write a program print the upper and lower triangle of the matrix.
34. Write a program to compute transpose of a matrix.
35. Write a program to find the inverse of a matrix.
36. Using recursion, (i) Find the factorial of a number (ii) Find Greatest Common Divisor (GCD) of two numbers (iii) To generate Fibonacci sequence (iv) Reverse ‘n’ characters.
37. Write a C program to convert a Roman numeral to its decimal equivalent.
38. Write a program to convert a given lowercase string to upper case string without using the inbuilt string function.
39. Write a program to count number of vowels, consonants and spaces in a given string.
40. Define a structure that will hold the data for a complex number. Using this structure, please write a program that will input two complex numbers and output the multiple of the two complex numbers. Use double variables to represent complex number components. Note: A complex number z is a number of the form z = a + bi where a and b are real numbers. The term a is called the real part of z and b is called the imaginary part of z. The multiplication operation on complex numbers is defined as: (a + bi) * (c + di) = (ac - bd) + (ad + bc)i
41. Write a function that will return the length of a character string. You are not allowed to use the strlen C library function. Note: Use “Pointers” concept
42. Write a function that returns the minimum and the maximum value in an array of integers.

43. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)
44. Write a program that prompts the user the name of a file and then counts and displays the number of bytes in the file. And create a duplicate file with the word '.backup' appended to the file name. Please check whether file was successfully opened, and display an error message, if not.
45. Write a program to create a file, open it, type-in some characters and count the number of characters in a file.
46. Write a program that will input a person's first name, last name, SSN number and age and write the information to a data file. One person's information should be in a single line. Use the function fprintf to write to the data file. Accept the information and write the data within a loop. Your program should exit the loop when the word 'EXIT' is entered for the first name. Remember to close the file before terminating the program. Hint: Use the function strcmp() to compare two strings.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	M	H	H	L	M	-	-	L	-	-	-	-	M	H	L
CO2	H	L	L	-	-	-	-	L	-	-	-	-	M	H	L
CO3	M	L	-	M	L	-	-	L	-	L	-	-	M	H	L
CO4	-	H	L	-	L	-	-	L	-	-	-	-	M	H	L
CO5	-	-	M	-	L	-	-	L	-	-	-	-	M	H	L

19EEP01: BASIC ELECTRICAL ENGINEERING LAB

Credits – 1 **Sessional Mark: 40**
(L: T: P: 0:0:2) **University Practical Exam Marks: 60**

Course Objectives:
1. To provide hands on experience to the students so that they are able to put theoretical concepts to practice.
2. To find the circuit response using KVL, KCL and various network theorems.
3. To conduct OC and SC test on single phase transformer.
4. To learn about various test conditions on DC shunt motor

Course Outcomes:
After completion of the course the student will able to
CO1. Apply suitable theorems for circuit analysis and verify the results theoretically.
CO2. Experimentally determine self-inductance, mutual inductance and coefficient of coupling
CO3. Analyze the performance of DC shunt motor, single phase transformer.
CO4. Verify KVL and KCL in a series and parallel resistive network.
CO5. Draw current locus diagrams

LIST OF EXPERIMENTS

1. Verification of KVL and KCL in a series and parallel resistive network.
2. Determination of coefficient of coupling of a coupled circuit.
3. Verification of Superposition Theorem.
4. Verification of Thevenin's Theorem.
5. Verification Norton's Theorem.
6. Verification of Maximum power transfer theorem with DC source.
7. Verification of Millman's Theorem
8. OC and SC test on single phase transformer.
9. Brake test on DC shunt motor.
10. Swinburne's tests on DC shunt motor.

Course Outcome-Program Outcome- Program Specific Outcomes (CO-PO-PSO) Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	H	M	-	-	-	-	-	-	M	-	L	H	M	-
CO2	M	H	M	M	-	-	-	-	-	M	-	-	M	H	-
CO3	M	H	M	M	-	-	-	-	-	M	-	-	M	H	-
CO4	H	M	M	M	-	-	-	-	-	M	-	-	H	H	-
CO5	H	H	M	-	-	-	-	-	-	M	-	-	-	H	-

19MEP01: ENGINEERING GRAPHICS

(Common to all branches)

Credits – 3 **Sessional Marks: 40**

L: T: P:: 0:0:6 **University Exam Marks: 60**

Course Objectives

To expose the students to the following

1. Develop the graphic skills for communication of concepts, ideas and design of engineering products.
2. Expose them to existing national standards related to technical drawings.
3. Develop skills in three-dimensional visualization of engineering component.
4. Learn sketching and taking field dimensions.
5. Take data and transform it into graphic drawings.
6. Learn basic engineering drawing formats, basic AutoCAD skills & draw 2D drawings in Auto CAD.

Course Outcomes

After successful completion of course the student should be able to

CO1. Prepare drawings as per standards.

CO2. Solve specific geometrical problems in plane geometry involving lines, plane figures and special Curves.

CO3. Produce orthographic projection of engineering components working from pictorial drawings.

CO4. Student's ability to perform basic sketching techniques will improve.

CO5. Students will be able to draw projections and sections, ability to produce engineered drawings will improve, will become familiar with Auto-CAD two-dimensional practice and standards.

CO6. Students will develop good communication skills and teamwork.

Part A

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance, Dimensioning principles, Conventions in Drawing.

Conics Sections: Ellipse - Eccentricity method, Arcs of circles Method, Oblong method and Four Center Method; Parabola - Eccentricity method, Rectangular method, Tangent method.

Hyperbola - Eccentricity method, Rectangular Hyperbola.

Principles of Projections: Principles of Orthographic Projections and Conventions.

Projection of Points, Projection of Lines (first angle projection only) inclined to both planes.

Projections of Planes: Projections of regular Planes (Triangle, Square, Rectangle, Pentagon, Hexagon and Circle) in simple position, inclined to both the planes.

Part B (Using AutoCAD)

Projections of Solids: Projections of right regular solids (Cube, Prism, Pyramid) in simple position, inclined to both the planes.

Isometric Projections: Isometric projection of right regular solids (Cube, Prism, Pyramid, Sphere). Conversion of given isometric views to orthographic views of simple objects.

Text Books

1. N.D. Bhat / Charotar, "Engineering Drawing", New edition.
2. K.L. Narayana and Kannaiah, "Engineering Drawing", Scitech Publishers.

Reference Books

1. Venugopal K, "Engineering Drawing and Graphics", New Age International.
2. P.J. Shah, "Engineering drawing', S. Chand.
3. Johle, "Engineering Drawing', Tata McGraw Hill.

Course Outcomes - Program Outcomes - Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H									M			H		
CO2		H	L							M			H	M	
CO3		L	M	H						M				H	
CO4	H									M			H	M	
CO5			M	H	L					M				M	
CO6					L				H	M			H		

B.Tech
II Year I Semester

B.Tech II Year I Semester

S.No	Course Code	Course Title
1	19BST08	Economics and Accountancy
2	19ECT32	Digital Logic Design
3	19MET16	Operations Research
4	19CST02	Discrete Mathematics
5	19CST03	Data Structures
6	19CST04	Data Communications
7	19ECP12	Digital Logic Design Lab
8	19CSP02	Data structures Lab
9	19CSP03	IT Workshop

19BST08: ECONOMICS AND ACCOUNTANCY

Credits – 4 **Sessional Marks: 30**
L:T:P::3:1:0 **University Exam Marks: 70**

Course Objectives

1. To impart in-depth knowledge of the subject and highlights the role of the economics, finance & accountancy in the field of engineering.
2. To strengthen the fundamentals of demand analysis & production function.
3. To estimate demand, price-output in different market structures.
4. To select the different investment alternatives
5. To know the financial position of the companies

Course Outcomes

After successful completion of the course the student should be able to

CO1. Define law of demand, assumption, production function & different types of costs
CO2. Apply demand forecasting techniques & BEP for estimation of demand & production
CO3. Identify the price-output in different competitions
CO4. Determine the feasible investment alternative.
CO5. Analyse the financial position of the company through ratio analysis.

UNIT I

Introduction to Economics: Economics – Micro & Macro Economics – Definitions - Significance & Limitations. Demand Analysis: Law of Demand, Demand Determinants. Elasticity of Demand: Definition, Types and Demand Forecasting methods.

UNIT II

Theory of Production: Firm and Industry – Production Function – Cobb Douglas Production function – Laws of returns – internal and external economies of scale. Break-Even Analysis: Concept of Break-even point (BEP) – Significance of BEP – Limitation - Assumptions - Break-even chart – Determination of BEP in volume and value (Simple problems).

UNIT III

Cost Analysis: Cost concepts, Fixed Vs Variable costs, explicit Vs implicit costs, Out-of-pocket costs Vs imputed costs and Opportunity cost. Introduction to Markets, Market structure, types of competition, features of Perfect competition, Monopoly, Monopolistic competition – Price output determination.

UNIT IV

Fundamentals of finance and Capital Budgeting: Capital and its significance – Types of Capital, Estimation of Fixed and Working Capital, requirements and methods of raising capital. Capital Budgeting Methods: Pay back method, Accounting Rate of Return (ARR) and Net Present Value (NPV) and IRR methods (Simple Problems).

UNIT V

Introduction to Financial Accounting and Financial Analysis: Double Entry Book Keeping – Journal, Ledger, Trial Balance, Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments. Ratio Analysis: Computation of Liquidity ratios (Current ratio and quick ratio), Activity Ratios (Inventory Turnover ratio, Debtors Turnover ratio) Capital Structure Ratios (Debt-equity Ratio and Interest Coverage ratio) and Profitability Ratios (Gross Profit ratio, Net Profit Ratio, Operating Ratio, P/E Ratio and EPS) Analysis and interpretation.

Text Books

1. Joel Dean, Managerial Economics, PHI 2001
2. James C. Van Home, Financial Management Policy
3. I.M. Pandy, Financial Management, PHI

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			**H**								**M**	**L**
CO2				**M**	**H**							**L**
CO3			**L**								**M**	
CO4				**L**	**M**						**H**	**L**
CO5				**M**							**H**	**L**

19ECT32: DIGITAL LOGIC DESIGN

Credits-3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course objectives

1. Tointroducethebasicrulesfordesignwithcombinationalandsequentialdigitallogicandstate machines.
2. To learn simple digital circuits in preparation for computerengineering.

Course Outcomes

After successful completion of the course the student should be able to
CO1.Define different Number systems, binary addition and subtraction, two's compliment representation & operations,different switching algebra theorems and apply them for logic functions
CO2.Define K-map for a few variables and perform an algorithmicreduction of logic functions and known about different combinational circuits
CO3.Learn about different sequential logic circuits
CO4.Learn HDL for combinational logic circuits.
CO5.Learn HDL for Sequential logic circuits.

UNIT I

Binary Systems: Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, Complements, Signed binary numbers, Binary codes, Binary Storage and Registers, Binary Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions canonical and standard forms, Other logic operations, Digital logic gates, Integratedcircuits.

UNIT II

Gate Level Minimization: The map method, Four-variable map, five variable map, Product of sums simplification, Don't care conditions, NAND and NOR implementation, Other Two level implementations, Exclusive-OR function,
Combinational Logic: Combinational Circuits, Analysis procedure, Design procedure, Binary Adder-Subtractor Decimal Adder, Binary multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexer.

UNIT III

Synchronous Sequential Logic: Sequential circuits, latches, Flip-flops, Analysis of clocked sequential, Hardware Description Language (HDL), HDL for Sequential circuits, HDL for logic circuits, State reduction and Assignment: Design procedure, Registers, Shift Registers,

UNIT IV

Ripple counters, Synchronous counters, Other Counters, HDL for Registers and Counters. Introduction, Random-Access Memory Decoding, Error Detection and Correction, Read-Only Memory,ProgrammableLogicArray,ProgrammableArrayLogic,SequentialProgrammableDevices.

UNIT V

Asynchronous Sequential Logic: Introduction, Analysis, procedure, Circuits with Latches, Design procedure, Reduction of state and flow tables, Race free state assignment Hazards, Design Example.

Text Books

1. M.MorrisMano,"DigitalLogicandComputerDesign"-3rdEdition,PearsonEducation/PHIThomson, "Fundamentals of Logic Design", Roth, 5thEdition.

References

1. Zvi.Kohavi, “Switching and finite automata Theory”, Tata Mc GrawHill
2. Donlad D.Givone,”Digital Principles and Design”, TataMc Graw Hill, Edition.
3. M.RafiquzzamanHohn Wiley, “Fundamentals of Digital Logic & Micro Computer Design”. 5th Edition.

CourseOutcomes-Program Outcomes-Program SpecificOutcomes-(CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	H	H	L	-	-	-	-	L	M	L	-	H	-	-
CO2	L	L	H	M	-	-	-	-	L	L	M	-	-	H	M
CO3	M	H	-	-	-	-	--	--	-	-	-	-	H	M	
CO4	H	L	-	-	-	-	-	-	-	-	-	-	-	H	M
CO5		L	L	M	H	-	-	-	-	-	-	-	-	M	H

19MET16: OPERATIONS RESEARCH

Credits – 4 **Sessional Marks: 30**
L:T:P ::3:1:0 **University Exam Marks: 70**

Course Objectives

To expose the students to the following

1. Familiarize optimized Decision Making models in Operations Management.

Course Outcomes

After successful completion of course the student should be able to

CO1. Define and formulate mathematical models for Operation Management.
CO2. Formulate the Assignment Models. `
CO3.Define replacement strategies for maintenance of production systems.
CO4. Understand game, queuing and decision theories.
CO5. Formulate multi-stage applications into a dynamic programming framework

UNIT I

Development: definition– characteristics and phases – types of operation research models – applications. Allocation: Linear programming problem formulation – graphical solution – simplex method – artificial variables techniques -two–phase method, big-M method – duality principle.

UNIT II

Transportation Problem: Formulation – optimal solution, unbalanced transportation problem – degeneracy, assignment problem – formulation – optimal solution - variants of assignment problem-traveling salesman problem.

Sequencing: Introduction – flow –shop sequencing – *n* jobs through two machines – *n* jobs through three machines – job shop sequencing – two jobs through 'm'machines.

UNIT III

Replacement: Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement.

UNIT IV

Theory of games: Introduction – mini. max (max. mini) – criterion and optimal strategy – solution of games with saddle points – rectangular games without saddle points – 2 x 2 games – dominance principle – m x 2 & 2 x n games –graphical method.

Waiting Lines: Introduction – single channel – poison arrivals – exponential service times – with infinite population and finite population models– multichannel – poison arrivals – exponential service times with infinite population single channel poison arrivals.

UNIT V

Dynamic Programming: shortest path problem, PERT, CPM, Applications and simulation techniques and applications.

Text Books

1. S.D.Sharma-Kedarnath, "Operations Research".
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, Tata McGraw Hill.

Reference Books

1. Hiller &Libermann, “Introduction to O.R”, Tata McGraw Hill.
2. A.M.Natarajan, P.Balasubramani, A.Tamilarasi, “Operations Research”, Pearson.
3. Maurice Saseini, ArhurYaspan& Lawrence Friedman., “Operations Research Methods & Problems”.
4. R.Pannerselvam, “Operations Research”, PHI Publications.

Course Outcomes - Program Outcomes - Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	H	M		M		M		L	L	M	L	H		M
CO2		H	M				M				M	L			M
CO3	H	H	M		M		M		L		M	L			M
CO4	H									L		M			M
CO5		H	M		M		M		L		M	M			

19CST02: DISCRETE MATHEMATICS

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Reason mathematically about basic data types and structures used in computer algorithms and systems.
2. Synthesize elementary proofs, especially proofs byinduction.
3. Model and analyze computational processes using analytic and combinatorialmethods.
4. Apply principles of discrete probability to calculate probabilities and expectations of simple random processes to solve a variety ofproblems.
5. Learn about graphs and trees.

Course Outcomes

After successful completion of course the student should be able to

CO1. Represent different information in the form of sets, relate them and express in terms of functions.
CO2. Apply principles of mathematical induction to prove various theorems.
CO3. Derive the solution using deductive logic and prove the solution based on logical inference for a given a problem.
CO4. Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
CO5. Develop the given problem as graph networks and solve with techniques of graph theory.

UNIT I

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

UNIT II

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic. Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination

UNIT III

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers.

Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

UNIT IV

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

UNIT V

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

Text Books

1. Bernard Kolman, Robert Busby, Sharon C. Ross, "Discrete Mathematical Structures", 6th Edition, Pearson Education,2014.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, Tata McGraw – Hill, 2012.

Reference Books

1. J.P. Tremblay and R. Manohar, "Discrete Mathematical Structure and It's Application to Computer Science", TMG Edition, Tata Mcgraw-Hill,2001.
2. Susanna S. Epp, "Discrete Mathematics with Applications", 4th edition, Wadsworth Publishing Co. Inc,2010.
3. C L Liu and D P Mohapatra, "Elements of Discrete Mathematics A Computer Oriented Approach", 3rd Edition, Tata McGraw – Hill,2008.

Web References

1.https://nptel.ac.in/courses/106/106/106106183/
2.https://nptel.ac.in/courses/106/105/106105192/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	H	-	-	L	-	-	L	-	-	-	-	H	-	-
CO2	-	L	H	-	-	-	-	-	-	-	-	-	H	-	-
CO3	-	L	H	-	-	-	-	-	-	-	-	-	H	-	L
CO4	-	M	M	-	-	-	-	-	-	-	-	-	H	-	-
CO5	-	-	H	H	-	-	-	-	-	-	-	-	H	M	L

19CST03: DATA STRUCTURES

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Basic concepts of object-oriented programming, data structures andalgorithms.
2. Stacks, queues, lists, graphs andtrees.
3. Concepts about searching and sortingtechniques.
4. Write algorithms for solving problems with the help of fundamental datastructures.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand the basic concepts of Object-Oriented Programming like inheritance, polymorphism, etc.
CO2. Analyse object-oriented concepts and identify various types of errors.
CO3. Solve various real time problems using data structures using Stacks, Queues and linked list.
CO4. Apply Graph search, traversal algorithms using OOPS concepts.
CO5. Develop algorithms and programs for various sorting and searching techniques.

UNIT I

Introduction to Object Oriented Programming: An overview of C++ Programming, classes and objects, constructors, destructors, templates, Data Abstraction, Inheritance, Overloading functions and operators, Polymorphism, Friend Functions, Inline Functions, Exception Handling.

UNIT II

Stacks and Queues: ADT Stack and its operations, Applications of Stacks: Expression Conversion and evaluation, ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue - Operations andapplications.

UNIT III

Linked Lists: Singly linked list, Doubly linked list, Circular linked list–operations and applications, linked stacks and queues.

Graphs: Basic Terminologies and Representations, Graph search and traversal algorithms-applications.

UNIT IV

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Heap Tree, Binary Search Tree, AVL Tree - operations and Applications of Binary Trees, B Tree, B+ Tree.

UNIT V

Sorting: Introduction to internal sorting, Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, externalsorting.

Searching: linear search, binary search, Hashing.

Text Books

1. Herbert Schildt, “Complete Reference C++”, Fifth edition, Tata McGraw-Hill,2015.
2. Ellis Horowitz, Sartaj Sahni, “Fundamentals of Data Structures in C++”, Illustrative edition, Galgotia publication,2008

Reference Books

1. BjarneStroustrup, “The C++ Programming Language”, 4th Edition,Addison-Wesley Professional, 2013.
2. Adam Drozdek, “Data Structures and Algorithms in C++”, 4th Edition, Cengage Learning,2012.
3. SartajSahni, “Data Structures, Algorithms and Applications in C++”, Second Edition, Silicon Press, 2005.

Web References

1. https://nptel.ac.in/courses/106/102/106102064/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	M	-	L	-	-	-	-	-	H	L	-
CO2	-	H	-	L	-	-	-	-	-	-	-	-	H	M	-
CO3	L	L	H	L	M	-	-	-	-	-	-	-	H	M	L
CO4	M	L	M	L	H	L	-	L	-	-	-	-	H	L	-
CO5	L	-	L	L	H	-	M	L	-	-	-	-	H	L	-

19CST04: DATA COMMUNICATION

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Concepts of data communication and itsimportance.
2. Information about transmissionmedia.
3. Behavioural knowledge of the data encoding andmodulation.
4. To describe the features and functions of multiplexing andmodulation.
5. To enable them to differentiate source and channelcoding.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand data, signals and transmission media.
CO2. Evaluate performance of the channel.
CO3. Analyse various transmission media, data encoding, modulation and multiplexing techniques.
CO4. Represent various data encoding and modulation techniques.
CO5. Identify the errors using source and coding methods.

UNIT I

Introduction: Data and Signal, Signal characteristics, Analog and Digital Signal, Analog and Digital Data Communication System, Transmission Impairments (Attenuation, Noise,Distortion)

UNIT II

Transmission Media: Copper Media and Fiber Optics, Unguided Transmission Media -Terrestrial Microwaves and Satellite Communication, Cellular System, Multipath Fading, Data Rate Limits - Nyquist Bit Rate for Noiseless Channel, Shannon Capacity for Noisy Channel, Performance of Channel - Bandwidth, Throughput, Latency, Jitter and Bit Error Rate (BER).

UNIT III

Data Encoding and Modulation: Baseband Communication (Analog/Digital), Data Encoding and Modulation, Types of Analog Modulation - AM, FM and PM, Pulse Modulation System - PAM and PWM, Encoding Analog Data as Digital Signal - PCM, Encoding Digital Data as Digital Signals, Line Coding Schemes - NRZ, RZ, Manchester and AMI, Block Coding, Scrambling, Digital Modulation - ASK, FSK, PSK, QAM.

UNIT IV

Multiplexing and Spreading: Multiplexing and Application, FDM, WDM, TDM, Random-Access, CDMA

UNIT V

Source and Channel Coding: Measure of Information, Huffman Coding, Error Detection and Correction Code, Hamming Distance, Linear Block Coding, Cyclic Codes, CRC, Convolution Codes

Text Books

1. William Stallings, “Data and Computer Communications”, 10th Edition, Pearson Education,2014.
2. Stallings W, “Data and Computer Communications”, Prentice Hall,2010.

Reference Books

1. Forouzan B. A., "Data Communication and Networking", McGraw Hill,2013
2. Lathi, B. P. & Ding, Z., "Modern Digital and Analog Communication Systems", Oxford University Press,2010.

Web References

1.https://nptel.ac.in/courses/106/105/106105082/
2.https://nptel.ac.in/courses/106/108/106108098/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	L	-	-	-	-	H	-	-	-	M	-	H	-	-
CO2	M	-	-	-	H	-	-	-	-	-	L	-	H	L	L
CO3	M	H	-	-	-	-	-	-	-	-	-	-	H	L	-
CO4	M	-	L	-	H	-	-	-	-	-	-	-	H	M	-
CO5	-	H	-	-	-	-	-	L	M	-	-	-	H	L	-

19ECP12: DIGITAL LOGIC DESIGN LAB

Credits-1 **Sessional Marks:40**

L: T:P::0:0:2 **University Exam Marks:60**

Course Objectives

1. To Know about the behavior of digitallogic.
2. To Understand combinational logic circuits and sequential logiccircuits.

Course Outcomes

At the end of the course, students will demonstrate the ability to:

CO1.Construct and experiment different logic gates .

CO2.Measure Test combinational logic circuits.

CO3.Usage different adders and subtractor.

CO4.Verify experimentallysequential logic circuits.

CO5.Identify the applications of decoders and display.

LIST OF EXPERIMENTS

1. Testing of Logicgates
2. Decoders
3. Encoders
4. Multiplexers
5. Demultiplexers
6. Half subtractor & Fullsubtractor
7. Half adder & Fulladder
8. Flip–Flops
9. MOD-10Counter
10. Shift register
11. Johnsoncounter
12. Seven SegmentDecoder.

Note: A minimum of 10 experiments have to be conducted.

Course outcomes-Program outcomes -Program Specific Outcomes(CO-PO-PSO) Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	M	H	H	L					L	M	L		H		
CO2	L	L	H	M					L	L	M			H	M
CO3	M	H											H	M	
CO4	H	L												H	M
CO5		L	L	M	**H**									M	H

19CSP02: DATA STRUCTURES LAB

Credits–1 **Sessional Marks:40**
L:T:P::0:0:2 **University Exam Marks:60**

Course Objectives

To expose the students to the following:

1. Develop skills to design and analyse simple linear and non-linear datastructures.
2. Strengthen the ability to identify and apply the suitable data structure for the given real-world problem.
3. Implement various sorting and searchingmethods

Course Outcomes

After successful completion of course the student should be able to

CO1. Identify and implement the appropriate data structure for a given problem.
CO2. Determine and simulate the appropriate searching and sorting techniques for a given problem.
CO3. Implement various graph traversal techniques.
CO4. Design solutions for real life computational problems

LIST OF PROGRAMS

1. Define a class to represent a bank account which includes the following members as Data members:a) Name of the depositor b)Account Number c)Withdrawal amount d)Balance amount in theaccount
   Member Functions:
   a) To assign initial values b) To deposit an amount c) To withdraw an amount after checking the balance d) To display name andbalance.
2. Write the above program for handling n number of account holders using arrayofobjects.
3. Write a C++ program to compute area of right-angle triangle, equilateral triangle, isosceles triangle using function overloadingconcept.
4. Write a C++ program to swap the values two integer members of different classes using friend function.
5. Define a class string and overload == to compare two strings and + operator for concatenation of two strings.
6. Consider an example of declaring the examination result. Design three classes: student, exam and result. The student has data members such as roll no, name. Create the lass exam by inheriting the student class. The exam class adds data members representing the marks scored in 5 subjects. Derive the result from exam-class and it has own data members like total, avg. Write the interactive program into model thisrelationship
7. Write a program that uses stack operations to convert a given infix expression into its postfix Equivalent, Implement the stack using anarray
8. Write a program to reverse the elements in the stack usingrecursion.
9. Write a program to implement the simple Queue and circularoperations
10. Write a program that uses functions to perform the following: a) Create a singly linked list of integers. b) Delete a given integer from the above linked list. c) Display the contents of the above list afterdeletion.
11. Write a program that uses functions to perform the following: a) Create a doubly linked list of integers. b) Delete a given integer from the above doubly linked list. c) Display the contents of the above list afterdeletion
12. Write a program to implement Circular linked listoperations
13. Determine the indegree and outdegree of all the vertices of a givengraph.
14. Write programs for implementing the following graph traversalalgorithms:

a. Depth firsttraversal
b. Breadth firsttraversal

15. Determine whether the given graph is connected graph ornot.
16. Write a program that uses functions to perform the following: a) Create a binary search tree of characters. b) Traverse the above Binary search tree recursively inPostorder.
17. Write a program that uses functions to perform the following: a) Create a binary search tree of integers. b) Traverse the above Binary search tree non-recursively ininorder.
18. Write a program to implementB-tree
19. Write a program to implement B++tree
20. Write a program to implement AVLtree
21. Write programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Bubble sort b) Insertion sort
22. Write programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Quick sort b) Selectionsort
23. Write programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Merge sort b) Heapsort
24. Write a program to implement external sortingtechnique.
25. Write a program to search for a given elementusing
    a. Linearsearch
    b. Binarysearch
26. Write a program to implement all the functions of a dictionary (ADT) usinghashing.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	H	-	L	H	-	-	L	-	-	-	-	M	H	L
CO2	M	M	-	L	H	L	-	-	-	-	-	-	M	H	L
CO3	-	M	-	-	H	M	-	-	-	-	-	-	M	H	L
CO4	-	M	H	-	H	-	-	-	-	-	-	-	M	H	L

19CSP03: IT WORKSHOP

Credits–1 **Sessional Marks:40**
L:T:P::0:0:2 **University Exam Marks:60**

Course Objectives

To expose the students to the following:

1. How to repair the faults occurredin
   a. Desktop
   b. Laptop
   c. Mobilephones
2. Training on PC Hardware, Internet & World Wide Web, Spread sheet computations, and Presentation.
3. Introduction to a personal computer and its basic peripherals, the process of assembling and installing a personal computer with system software along with Troubleshooting.
4. Introduction to the usage of Productivity tools in crafting professional word documents, excel spread sheets and power point presentations using open office tools andLaTeX.

Course Outcomes

After successful completion of course the student should be able to

CO1. Perform all maintenance tasks related to desktop, laptop and mobile phones
CO2. Apply knowledge for computer assembling and software installation.
CO3. Solve the trouble shooting problems.
CO4. Utilise the tools for preparation of PPT, documentation and budget sheet etc.

LIST OF EXPERIMENTS

1. Maintenance ofDesktop
2. Maintenance ofLaptop
3. Maintenance of MobilePhones
4. HardwareTroubleshooting
5. SoftwareTroubleshooting
6. Web Browsers, Surfing theWeb
7. Search Engines &Netiquette
8. CyberHygiene
9. Development of webpages
10. Word Orientation along withLaTex
11. Utilization of LaTeX and Word to create project certificate
12. Creatingprojects
13. Creating aNewsletter
14. Spread sheetOrientation
15. CalculatingGPA
16. Creating PowerPoint

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	-	H	M	-	M	-	L	-	H	-	-	M	-	-
CO2	H	M	-	M	-	L	-	L	M	M	-	L	M	-	-
CO3	H	L	-	M	L	-	L	L	L	M	-	-	M	-	-
CO4	L	L	M	-	H	-	-	L	-	-	-	-	L	H	-

B.Tech
II Year II Semester

B.Tech II Year II Semester

S.No	Course Code	Course Title
1	19BST07	Probability and Statistics
2	19BST09	Industrial Management
3	19CST05	Computer Architecture and Organization
4	19CST06	Object Oriented Programming
5	19CST07	Database Management Systems
6	19CST08	Theory of Computation
7	19BST12	Environmental Studies
8	19CSP04	Object Oriented Programming Lab
9	19CSP05	Database Management Systems Lab
10	19CSP06	Mathematical Tool Kit Lab

19BST07: PROBABILITY AND STATISTICS

Credits - 3 **Sessional Marks: 30**
L: T: P :: 2:1:0 **University Exam Marks: 70**

Course Objectives

1. To study the fundamental concepts like random variables, probability, probability distributions, sampling.
2. To understand the statistical concepts of estimation, hypothesis testing, regression, correlation analysis and multiple regression.
3. To equip students with essential tools for statistical analyses at the graduate level.
4. To familiarize the techniques of ANOVA designs and reliability most frequently used in engineering and applied research.

Course Outcomes

Students should be able to

CO1. Find probabilities of single events, complementary events and the unions and intersections of collections of events.
CO2. Derive the probability density function of random variables and use these techniques to generate data for various distributions.
CO3. Calculate the mean and variance of continuous and discrete random variable.
CO4. Describes the Sampling distribution of mean when σ- known or unknown.
CO5. Differentiate between a population and a sample
CO6. Identify features that determine the width of a confidence interval.
CO7. State and apply the definitions of the t, F and χ 2 distributions in terms of the standard Normal.
CO8. Define the concept of least squares estimation in linear regression.
CO9. State the modelling assumptions underlying ANOVA.

UNIT I

Probability & Random Variables: Probability- Axioms of Probability-some elementary Theorems-Conditional probability-Baye's theorem.Random Variables: Discrete and Continuous random variables, Distribution function of random variable, Properties, Probability mass function, Probability density function, Mathematical expectation, Properties of Mathematical expectations, Mean and Variance.

UNIT II

Probability Distributions: Binomial Distribution, Mean and StandardDeviations of Binomial Distribution, Poisson distribution, Mean andStandard Deviations of Poisson Distribution. Continuous Distributions: Normal Distribution, Mean, Variance andarea properties.

UNIT III

Sampling Distributions, Inferences concerning means, Inferences concerning variances

Populations and Samples, The Sampling Distribution of the Mean (σ Known), The Sampling Distribution of the Mean (σ Unknown), The Sampling Distribution of the Variance. Point Estimation, Interval Estimation, Bayesian Estimation, Tests of Hypotheses, Null Hypotheses and Significance Tests, Hypotheses Concerning One Mean, Operating Characteristic Curves, Hypotheses Concerning Two Means, The Estimation of Variances, Hypotheses Concerning One Variance, Hypotheses Concerning Two Variances.

UNIT IV

Test of Significance (small samples): Student's t – test, test for ratio of variance (or) F – test, Chi – square test for Goodness of fit and independence of attributes - The method of least squares-fitting a straight line, second degree parabolas and more general curves - Curvilinear Regression –Multiple Regressions, Correlation.

UNITV

Anova: Analysis of variance - one way classification, two way classification, Completely Randomized Designs.Reliability – Failure –Time Distributions-The exponential Model Reliability –The Weibull Model in Life Testing.

Text books

1. T.K.V.Iyengar & B.Krishna Gandhi et. al, "Probability and Statistics", S. Chand & Company, Vol.III.
2. Irwin Miller, John E.Freund,"Probability and Statistics for Engineers", Pearson Global edition, 9th edition.
3. S C Gupta and V.K.Kapoor,"Fundamentals of Mathematical Statistics", S. Chand & Son's, 10th edition 2000.
4. Shahnaz Bathul,"A text book of Probability and Statistics", Ridge Publications, 2nd edition.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M										
CO2	H	L			M							
CO3	H	M										
CO4	H	L					M					
CO5	M	H					L					
CO6	M	H										
CO7	H	M										
CO8	H	M										
CO9	H	M										

19BST09: INDUSTRIAL MANAGEMENT

Credits – 3 **Sessional Marks: 30**
L:T:P::3:0:0 **University Exam Marks: 70**

Course Objectives

1. To impact in-depth knowledge of the subject andhighlights the role of the management in the field of engineering.
2. To strengthen the fundamentals of management functions and organisation structures.
3. To select the suitable type of organisation
4. To know the feasible location for the plant & layout
5. To understand the role of human resource management in organisations.
6. To select suitable marketing mix, channels of distribution for the organisation

Course Outcomes

After successful completion of the course the student should be able to

CO1. Define the function of management, organisation, material management & HRM
CO2. Evaluate the thoughts of management, performance of employees & job evaluation.
CO3. Identify the type & location of organisation.
CO4. Understand the functions of HRM
CO5.Determine the marketing mix, channels of distribution and PLC

UNIT I

Introduction to Management: Concept of Management - Functions of Management – Evaluation of Management Thought: Taylor's Scientific Management, Fayol's principles of Management, Douglas MC Gregor's theory X and Y, Maslow's Hierarchy of human needs.

UNIT II

Organisation: Concept - Principles of organisation. Organisational Structure: Line Organisation, Functional Organisation and Line and Staff Organisation. Types of Business Organisations: Features, Merits and Demerits of Sole trading Proprietorship, Partnership, Joint stock Companies.

UNIT III

Introduction to Operations Management: Plant location and Layout, Methods of Production. Work-study: Method study- Procedure and charts. Work measurement – procedure & work sampling. Materials Management: objectives of inventory control - EOQ & ABC analysis.

UNIT IV

Introduction to Human Resource Management: The concept of HRM. Functions of the HR manager - Manpower planning, Recruitment, Selection, Training and Development, Performance Appraisal and Job evaluation.

UNIT V

Marketing: Marketing –Definition –Marketing concepts–Marketing Environment - Marketing Mix, Marketing Vs Selling, Stages in Product Life Cycle, Channels of Distribution.

Text Book

1. A.R. Aryasri , Management Science for JNTU (B.Tech), TMH, 2002

Reference Books

1. Koontz and O'Donnel, Principles of Management, MC Graw Hill, 2001
2. Phillip Kotler, Marketing Management (11th Ed 2002) Prentice Hall of India.
3. Gary Dessler, Human Resource Management, Pearson Education, Asis, 2002
4. O.P. Khanna, Industrial Engineering & Management, Dhanpat Rai 1999
5. Chandra Bose, Management and Administration, Prentice Hall, 2002
6. W. Glueck & L.R. Jauch, Business Policy and Strategic Management, MC Graw Hill,

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								**H**				
CO2					**M**				**H**			**L**
CO3									**H**		**M**	
CO4					**L**				**H**		**M**	**L**
CO5									**H**		**M**	**L**

19CST05: COMPUTER ARCHITECTURE AND ORGANIZATION

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. How Computer Systems work & the basic principles, Instruction Level Architecture andInstruction Execution, the data is represented and the operations are carried out in thecomputer
2. Perform memory systemdesign
3. Access I/O devices and itsprinciples.
4. Enhance the knowledge on Instruction LevelParallelism
5. Develop the skills on microprogramming.
6. Apply the concepts of advanced pipeliningtechniques.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand the building blocks of computer, instruction execution cycle, I/O transfers, interrupts, and memory organization.
CO2. Identify addressing modes, and data/instruction formats, advantage of the pipelining and parallel processors.
CO3. Perform the arithmetic operations using various algorithms and number systems and design memory in various ways.
CO4. Detect errors in the transmission.
CO5. Compare various cache memory mapping techniques.

UNIT I

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU, registers, instruction execution cycle, RTL Interpretation of instructions, addressing modes, instruction set, instruction formats.

UNIT II

Data representation: Signed number representation, fixed and floating-point representations, character representation. Algorithms for arithmetic operations: Addition, Subtraction, multiplication (Booth's, Modified Booth's) - division (restoring and non-restoring)

UNIT III

Memory Organization: Memory systems hierarchy-Main memory organization-Types of Main memory-memory interleaving and its characteristics and performance- Cache memories: address mapping-line size-replacement and write policies, Reliability of memory systems- error detecting and error correcting systems.

UNITIV

Peripheral devices and their characteristics: Input-output subsystems, I/O device Interface, I/O transfers–program controlled, interrupt driven andDMA

UNIT V

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency

Text Books

1. William Stallings, "Computer Organization and Architecture: Designing for Performance", 10th Edition, Pearson Education,2016.
2. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", 5th Edition, Morgan Kaufmann, Elsevier,2011.

Reference Books

1. Carl Hamacher, "Computer Organization and Embedded Systems", 6th Edition, McGraw Hill Higher Education,2011.
2. Vincent P. Heuring, Harry F. Jordan, and T.G. Venkatesh, "Computer System Design and Architecture", 2nd Edition, Pearson Education,2008.

Web References

1.https://nptel.ac.in/courses/106/106/106106166/
2.https://nptel.ac.in/courses/106/105/106105163/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	L	-	-	-	-	-	-	-	-	-	H	-	-
CO2	-	H	-	M	-	-	-	-	-	-	-	-	H	-	M
CO3	-	H	M	-	-	-	-	L	-	-	-	-	H	M	-
CO4	L	-	-	H	-	-	-	-	-	-	-	-	H	-	-
CO5	-	L	-	H	-	-	-	-	-	-	-	-	M	L	L

19CST06: OBJECT ORIENTED PROGRAMMING

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Study the syntax, semantics and features of Java ProgrammingLanguage.
2. Learn inheritance, polymorphism andinterfaces.
3. The method of creating Multi-threaded programs and handleexceptions.
4. Java features to create GUI applications & perform eventhandling.
5. Basics of Java Data BaseConnectivity.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand the basic concepts of object oriented programming.
CO2. Solve problems using object-oriented approach and implement them using Java.
CO3. Write efficient programs with multitasking.
CO4. Create own Exceptions and handle Exceptions.
CO5. Develop GUI Components and design application projects.
CO6. Design java application to connect to Database.

UNIT I

OOP concepts: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, Polymorphism

Java Programming: History of java, comments, data types, variables, constants, scope and life time of variables, operators, hierarchy expressions, type conversions and casting, enumerated types, control for block scope, conditional statements, loops, break and continue statements, simple java standalone programs, arrays, console input and output, formatting output, constructors, methods, parameter passing, static fields and methods, access controls, this reference, overloading methods and constructors, recursions, garbage collections, building strings, exploring strings class.

UNIT II

Inheritance: Inheritance hierarchies super and sub classes, member access rules, super keyword, and preventing inheritance: final classes and methods, the object class and its methods.

Polymorphism: Dynamic binding, method overloading, abstract classes and methods.

Interface: Interface vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interfaces references, extending interface.

Inner classes- use of inner classes, local inner classes, anonymous inner classes, static inner classes, example

Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages

UNIT III

Exception Handling: Dealing with errors, benefits of exception handling, the classification of exceptions, exception hierarchy, checked exceptions and unchecked exception, usage of try, catch, throw, throws, and finally, re-throwing exceptions, exception specification, built in exceptions, creating own exception sub classes.

Multithreading-difference between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter-thread communication, producer consumer pattern.

UNIT IV

Collection Framework in Java: Introduction to java collections, overview of java collection frame work, Generics, Commonly used Collection Classes-Array List, vector, Hash table, Stack, Enumeration, Iterator, String Tokenizer, Random, Scanner, calendar and Properties.

Files: Streams-byte streams, character streams, text input/output, binary input/output, random access file operations, file management using File class.

Connecting to Database: JDBC type I to IV drivers, connecting to a database, querying a database and processing the results, updating data with JDBC

UNIT V

GUI Programming with Java: The AWT class hierarchy, introduction to Swing, Swing vs. AWT, Hierarchy for Swing components, Containers-JFrame, JApplet, JDialog, JPanel, Overview of some swing components, JButton, JLabel, JTextField, JTextArea, simple Swing applications, Layout management- Layout manager types- border grid and flow.

Event Handling: Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, examples: handling a button click, handling mouse events, Adapter classes.

Text Books

1. Herbert Schildt,DaleSkrien, "Java Fundamentals-A Comprehensive Introduction", 1st Edition, McGraw-Hill,2013.
2. Herbert Schildt, "Java the complete Reference", 8th Edition, McGraw-Hill, Osborne2011.

Reference Books

1. P.Radha Krishna, "Object Oriented Programming through java", Universities Press,2007.
2. Bruce Eckel, "Thinking in Java", Pearson Education,2006.
3. S.Malhotra and S.Choudhary, "Programming in Java", Oxford University Press,2013.

Web References

1. http://www.javatpoint.com/java-tutorial
2. http://www.javatutorialpoint.com/2015/03/introduction-to-java.html

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	-	-	-	-	-	-	H	-	-
CO2	L	M	H	-	-	-	-	-	-	-	-	-	H	M	-
CO3	-	M	H	L	-	-	-	-	-	-	-	-	L	H	L
CO4	-	H	M	-	-	-	-	-	-	-	-	-	L	H	-
CO5	L	-	H	-	M	-	-	-	-	-	-	-	L	H	M
CO6	M	L	H	-	-	-	-	-	-	-	-	-	L	H	-

19CST07: DATABASE MANAGEMENT SYSTEMS

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Basics of databasesystems.
2. Understand the different issues involved in the design and implementation of a databasesystem.
3. Study the physical and logical database designs, database modelling, relational, hierarchical, and networkmodels.
4. Use data manipulation language to query, update, and manage adatabase.
5. Normalization, indexing, transaction management and concurrencycontrol.

Course Outcomes

After successful completion of course the students should be able to

CO1. Understand the basics of database systems, recovery techniques and transaction processing system.
CO2. Write relational algebra expressions for a given query and optimize the developed expressions.
CO3. Design ER model for given database specifications.
CO4. Perform normalization for the given schema and various operations of indexing.
CO5. Construct the SQL queries for given specifications and Optimize its execution using Query optimization algorithms for a given query.
CO6. Demonstrate the isolation property, including locking, time stamping based on concurrency control and serializability of scheduling.

UNIT I

Overview of Database Systems: Introduction, File Systems versus DBMS, Advantages of DBMS, Describing and Storing Data in a DBMS: The Relational Model, Levels of Abstraction in a DBMS, Data Independence, Database Architecture, Structure of a DBMS, Database users, Data Models.

UNIT II

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model: Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation.

The Relational Model: Introduction, Creating and Modifying Relations Using SQL, Integrity Constraints over Relations: Key Constraints, Foreign Key Constraints, General Constraints, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Entity Sets to Tables, Relationship Sets (without Constraints) to Tables, Translating Relationship Sets with Key Constraints, Translating Relationship Sets with Participation Constraints, Translating Weak Entity Sets Introduction to Views: Views, Data Independence, Security, Updates on Views, Destroying/Altering Tables andViews.

UNIT III

SQL: The Form of a Basic SQL Query: Examples of Basic SQL Queries, Expressions and Strings in the SELECT Command, UNION, INTERSECT, and EXCEPT, Nested Queries: Introduction to Nested Queries, Correlated Nested Queries, Aggregate Operators: The GROUP BY and HAVING Clauses, Joins

Normalization: Purpose of normalization (or) schema refinement, concept of functional dependency, normal forms (1NF, 2NF, 3NF, BCNF & 4NF), Lossless join and Dependency preservation decomposition.

UNIT IV

Overview of Storage and Indexing: Data on External Storage, File Organizations and Indexing: Clustered Indexes, Primary and Secondary Indexes, Index Data Structures: Hash Based Indexing, Tree Based Indexing, ISAM, B+ Trees.

UNIT V

Overview of Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions: Concurrent Execution, Serializability, Two phase Locking (2PL), Strict 2PL.

Concurrency Control: Serializability, View Serializability, Lock Management: Types, Lock conversions, dead locks, Concurrency Control without Locking: Time stamp- based concurrency control, Multiple Granularity locking, Database Recovery Techniques

Text Books

1. R. Elmasri and S. Navathe, "Fundamentals of Database Systems", Global Edition, Pearson Education,2016.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 6th Edition, McGraw-Hill,2010.

Reference Books

1. Raghu Ramakrishnan, Johannes Gehrke, "Database management Systems", Third Edition, 2003.

Web References

1.https://nptel.ac.in/courses/106/104/106104135/
2.https://nptel.ac.in/courses/106/105/106105175/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	L	-	-	-	-	-	-	-	-	-	H	-	-
CO2	L	H	-	L	M	-	-	-	-	-	-	-	H	-	-
CO3	L	M	H	-	M	-	-	-	-	-	-	-	H	M	-
CO4	L	L	-	M	H	-	-	-	-	-	-	-	H	-	-
CO5	-	L	M	H	M	-	-	-	-	-	-	-	H	M	-
CO6	L	M	M	L	H	M	-	-	-	-	-	-	H	M	L

19CST08: THEORY OF COMPUTATION

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Build the skills for designing finite automata to accept a set of strings of alanguage.
2. Develop knowledge about the formal notation for strings, languages andmachines.
3. Learn basic concepts related to regular expressions and Turing machine and its relatedconcepts.
4. Design context free grammars to generate strings from a context free language and convert them into normalforms.
5. Enhance their knowledge to about pushdown automata and enable them to convert CFG toPDA.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand a formal notation for strings, languages and machines, the hierarchy of formal languages, grammars and machines.
CO2. Design finite automata to accept a set of strings of a language, context free grammars to generate strings of context free language.
CO3. Apply concepts of context free grammars to resolve the real-time problems.
CO4. Determine whether the given language is regular or not, equivalence of languages accepted by Push-Down Automata and languages generated by context free grammars.
CO5. Analyse languages of Turing machine.

UNIT I

Finite Automata: Alphabets, Strings, Grammar and Languages, Chomsky Hierarchy, Finite Automata, Representation of FA, Types of Finite Automata, Conversion of NFA into DFA, Equivalence of DFA and NFA, Finite Automata with Epsilon transitions (ϵ-NFA or NFA- ϵ), Finite Automata with output, Conversion of one machine to another, Minimization of Finite Automata, Myhill-Nerode Theorem, Applications and Limitation of FiniteAutomata.

UNIT II

Regular Expressions: Regular Expressions (RE), Identity Rules, The Arden's Theorem, Applications of Pumping Lemma, Equivalence of Two FAs, Equivalence of Two REs, Construction of Regular Grammar from RE, Constructing FA from Regular Grammar, Closure properties of RLs, Pumping Lemma for RLs, Decision problems of RLS, Applications of REs and FAs.

UNIT III

Context Free Grammars: Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars, Left recursion and Left factoring, Linear Grammar, Conversion Methods of Linear Grammar, Normal Forms for Context Free Grammars, Pumping Lemma for CFLs, Closure Properties, Applications of Context FreeGrammars.

UNIT IV

Pushdown Automata: Pushdown Automata, Instantaneous Description, Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Conversion of CFG to PDA and PDA to CFG, Equivalence of Pushdown Automata, Two Stack Pushdown Automata.

UNIT V

Turing Machine: Turing Machine, Instantaneous Descriptions, Representation of TMs, Language Acceptance of a Turing Machine, Design of Turing Machines, Variations of Turing Machines, Church's Thesis, Universal Turing Machine, Linear Bounded Automata, TM Languages, Unrestricted grammar, Properties of Recursive and Recursively enumerable languages, Un-decidability, Reducibility, Un-decidable problems about TMs, Post Correspondence Problem (PCP), Modified PCP.

Text Books

1. Shyamalendu Kandar, "Introduction to Automata Theory, Formal Languages and Computation", Pearson education,2013.
2. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, "Introduction to Automata Theory, Languages, and Computation", Pearson Education Asia,2012.

Reference Books

1. Peter Linz, "An Introduction to formal languages and automata", 6th Edition, Jones & Bartlett, 2012.
2. Rajendra Kumar "Theory of Automata, Languages and Computation", McGraw Hill,2014.
3. Krithivasan Kamala, Rama R, "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education,2009.

Web references

1.https://nptel.ac.in/courses/106/106/106106049/
2.https://nptel.ac.in/courses/106/104/106104148/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	-	-	-	-	-	-	H	-	-
CO2	-	M	H	-	-	-	-	-	-	-	-	-	H	-	L
CO3	-	L	H	-	-	-	-	M	-	-	-	-	H	-	L
CO4	-	L	-	H	-	-	-	-	-	-	-	-	H	-	L
CO5	-	H	-	-	-	-	-	-	-	-	-	-	H	-	-

19BST12: ENVIRONMENTAL STUDIES

Credits – No credits
L:T:P::3:0:0

Course Objectives

1. To reflect on how the natural and built environments shape and are shaped by multiple socio-cultural and political factors.
2. To think across and beyond existing disciplinary boundaries, mindful of the diverse forms of knowledge and experience that arises from human interactions with the world around them.
3. To live responsibly and appreciate the environmental and cultural histories of the places they inhabit.
4. To nurture knowledge, respect, and love for the natural and human communities of central Maine, the place where they spend four formative years of their lives.
5. To develop skills of analysis and communication, bearing in mind disciplinary traditions and diverse publics.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.

CO2. Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.

CO3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.

CO4. Appreciate that one can apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.

CO5. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

UNIT I

Environmental studies and Natural resources-Definition of environment, scope and importance of environment, environmental studies, need for public awareness.

Renewable and **Non Renewable Resources and associated problems and case studies-** Uses, consequences of exploitation and remedies- (i) Water resources,(ii) Forest resources, (iii) Land resources, (iv) Mineral resources, (v) Food resources, (vi) Energy resources. Role of individual in conservation of natural resources. Equitable use of resources for sustainable life styles.

UNITII

Environmental Pollution and Global Effects - Definition, Causes, Effects and Control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution and Noise pollution . Case studies.Role of an individual in prevention of pollution.

Solid waste Management- Causes, effects, disposal methods, and control of urban and industrial wastes.

Climate change- Global warming, Acid rain and Ozone layer depletion, Nuclear accidents and holocaust-case studies.

UNIT III

Disaster Management – Floods, earth quake, cyclone, avalanches, landslides and Tsunami.

Environment and Human health – Epidemic diseases, and pathology of Hepatitis –b, HIV/AIDs Malaria, Typhoid, Chikungunya, Avian flu and anthrax *etc.* Role of information technology in environment and human health, Case studies

Water conservation- Rain water harvesting – Water shed management.

Waste land reclamation

UNITIV

Ecosystem- Concept of an ecosystem,Structure and functions of an ecosystem; types of ecosystems, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Types of ecosystems- characteristic feature, structure and functions.

Biodivesity and its conservation –Introduction; Definition; genetic, species and ecosystem diversity; Endangered and endemic species of India; Value of biodiversity- consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, national and local level; Importance of biodiversity; Biodiversity hot-spots; India as a mega-diversity nation. Threats to biodiversity: habitats loss, poaching of wild life man wild life conflicts. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNITV

Human population and the environment-Population growth and variation among nations, Population explosion - Family welfare program in specific to women and child, Human rights, Value education.

Environment Impact Assessment; Environmental risk assessment (ERA); Clean production and Life cycle assessment.

Environmental Legislation - Forest Act, Water Act, Air act, Wild life protection Act, Environmental protection Act. Issues involved in enforcement of environmental legislation and public awareness.

Reference Books

1. Kaushik & Kaushik, Environmental Studies, New age international Publishers, 4th Edition,
2. B.R. Shah and Snehal Popli, Environmental Studies, Mahajan Publishing House.9th Edition,
3. C.S. Rao, Environmental Pollution Control Engineering,2nd Edition, New age International Publishers.
4. Canter, L.W., Handbook of Environmental Impact Assessment, Vol. I and II', The World Bank,Washington, 1991.
5. Pelczer, Jr., M.J., Chan, E.C.S., Krieg, R. Noel., and Pelczer Maerna Foss, 'Microbiology'. 5th Edition Tata Mc Graw Hill Publishing Company Limited, New Delhi-1996.
6. Metcalf & Eddy, Inc. "Wastewater Engineering Treatment Disposal and Reuse", Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi-1995.
7. Casey.I.J., 'Unit Treatment processes in Waste water engineering', John Wiley & Sons England, 1993.
8. Erach Bharucha, "Text book of Environmental Studies, UGC
9. DD Mishra,"Fundamental concepts in Environmental Studies", S Chand & Co Ltd

19CSP04: OBJECT ORIENTED PROGRAMMING LAB

Credits–1 **Sessional Marks:40**
L:T:P::0:0:2 **University Exam Marks:60**

Course Objectives

To expose the students to the following:

1. Understand and solve logical and mathematicalproblems.
2. Programming methodologies using Java and Pythonprogramming.

Course Outcomes

On successful completion of course the students should be able to:

CO1. Demonstrate knowledge in Data Types, Variables, Expressions, Control statements, Strings and Text files, Lists, Dictionaries and Functions, Objects and Design with classes, Exception Handling and GUI.

CO2. Analyse complex computational problems.

CO3. Design solutions for real life computational problems.

CO4. Solve complex problems using python and Java scripting constructs.

LIST OF JAVA PROGRAMS

1. Preparing and practice – Installation of Java software, study of anyIntegrated development environment, sample programs on operator precedence and associativity, class and package concept, scope concept, control structures, constructors and destructors. Learn to compile, debug and execute java programs.
2. Write program(s) on use of inheritance, preventing inheritance using final, abstractclasses.
3. Write program(s) on dynamic binding, differentiating method overloading andoverriding.
4. Write program(s) on ways of implementinginterface.
5. Write a program to develop an applet that displays a simplemessage.
6. Write a program to develop an applet for waving a Flag using Applets andThreads.
7. Write program(s) which uses the exception handling features of the language, creates exceptions and handles them properly, uses the predefined exceptions, and create ownexceptions
8. Write program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it's not a duplicate of any number already read. Display the complete set of unique values input after the user enters each new value.
9. Write program(s) on creating multiple threads, assigning priority to threads, synchronizing threads, suspend and resumethreads
10. Write a program to split a given text file into n parts. Name each part as the name of the original file followed by .part<n> where n is the sequence number of the partfile.
11. Write a program to create a super class called Figure that receives the dimensions of two-dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub classes override area() so that it returns the area of a rectangle and trianglerespectively.
12. Write a program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every threeseconds
13. Design a simple calculator which performs all arithmetic operations. The interface should look like the calculator application of the operating system. Handle the exceptions ifany.
14. Write a program to handle mouseevents
15. Write a program to handle keyboardevents

16. Write a program that allows conduction of object type examination containing multiple choice questions, and true/false questions. At the end of the examination when the user clicks a button the total marks have to be displayed in the form of themessage.
17. Write a program that creates menu which appears similar to the menu of notepad application of the Microsoft windows or any editor of yourchoice.
18. Write a program that creates dialog box which is similar to the save dialog box of the Microsoft windows or any word processor of yourchoice.
19. Write a program that correctly implements producer consumer problem using the concept of inter threadcommunication
20. Write a program to find and replace pattern in a givenfile.

LIST OF PYTHONPROGRAMS

1. A map shows a scale of a:b. The distance between a car track and a temple on the map is shown to be 'x' cm. Given the value of 'a', 'b' and 'c' design a flowchart and write a Python code to determine the actual distance between the car and temple in meters. For example, if a is 1, b is 5000 and c is 8 then the actual distance between car and temple is 400meters
2. Given a day in April and the number of holidays, develop an algorithm and write a Python code to determine the reopening day of school. For example, if the day given is April 16 and number of holidays as 53 the reopening day will be June 9 and print it as 9, 6. The number of holidays can be only to the maximum of60.
3. Ram has two square eggs trays of dimensions 'm' and 'n' and Raju has got some number of square trays of dimension 'p'. Ram has bought 'r' eggs. Design a flowchart and write a Python code to determine the number of trays he has to borrow from Raju to store eggs in the fridge. Assume an ideal condition that Raju will have the number of trays required by Ram. For example, if the value of m, n, p and r are 3, 2, 2, 20 then Ram has to borrow two trays fromRaju.
4. Given the diameter of a circular pizza in cms and price in rupees, design a flowchart and write a Python program to calculate the cost per square inch of a pizza. The formula to calculate area is A= pi $*r^2$ and1cm=0.393inch.
5. Given the circumference of a circular clock as 'C' cms, find the distance travelled by seconds clock in 'S' seconds. For example, if circumference of the clock is 64 cm then the distance travelled by the clock in 15 seconds is 15cm.
6. Given the radius of a circular ground in meters and speed of a bike in m/s. Determine the approximate number of seconds that will be taken by the bike to go around the ground once. Formula to calculate circumference of a circular ground = 2*pi*r. Assume that the bike will maintain an uniform speed and round the number of seconds taken to upper bound. That is 10.1, 10.5, 10.9 etc should be 11. For example, if the radius of the ground is 100 m and speed of bike as 40m/s, then the time taken to go around once is approximately 16seconds.
7. There are 50 p coins and Re 1 coin in a box. Given that the box contains 'X' number of 50 p coins and the number of Re 1 coin is twice as the number of 50 p coins, draw a flow chart and write a Python code to determine the total amount in thebox.
8. Ram buys a sweet box with 'T' sweets in it and distributes it to his two children. He distributes 'X' percentage of the sweets given to his son and he gets 'N' number of sweets. Write an algorithm to determine the number of sweets got by his daughter and total number of sweets. For example, if Ram distributes 60% to his son and he gets 12 sweets then his daughter will get 8 sweets and there are 20 sweets in thebox.
9. A dealer had Rs. 'X'. He purchased 'n' number of television sets, each costing Rs 'Y'. He used the remaining amount of money to purchase 'm' number of washing machines. Draw a flowchart to determine the cost of each washing machine? For example, if the dealer had 25,000 in hand and he bought 2 television sets of cost Rs. 12250 and if he bought 3 washing machines then the cost of one washing machine is4250.

10. Molecular weight of Ethane is calculated as 2 * Number of Carbon atoms + 6 * Number of Hydrogen atoms. Given the number of Carbon and Hydrogen atoms, design a flowchart and Write a Python program that determines the molecular weight of ethane (C_2H_6). Use the followingweights:

Atom	Weight (grams/mole)
H	1.0079
C	12.011
O	15.9994

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	-	-	-	-	-	-	M	H	L
CO2	L	M	H	-	-	-	-	-	-	-	-	-	M	H	L
CO3	-	M	H	L	-	-	-	-	-	-	-	-	M	H	L
CO4	-	H	M	-	-	-	-	-	-	-	-	-	M	H	L

19CSP05: DATABASE MANAGEMENT SYSTEMS LAB

Credits–1 **Sessional Marks:40**
L:T:P::0:0:2 **University Exam Marks:60**

Course Objectives
To expose the students to the following:
1. Develop conceptual understanding of database managementsystem.
2. Understand how a real-world problem can be mapped toschemas.
3. Solve different industry levelproblems.

Course Outcomes
On successful completion of course students should be able to
CO1. Define a problem at the view level.
CO2. Understand the physical structure of the database to handle data.
CO3. Implement the logic by using software.
CO4. Apply the concepts of transaction management for real time applications.

LIST OF EXPERIMENTS

1. Queries on DDL commands (Create, Alter, Drop, Rename)

Task 1:
a. Create a table with the following schema
Student (sid, sname, saddress,sphone)
b. Write a query to display structure of the table as student (sid, sname, saddress, sphone,smail)
c. Write a query to display structure of the table as student (sid, sname, sphone,smail)
d. Write a query to change the name of the column smail tosmailid
e. Drop the tablestudent

Task 2:
a. Create a table with the following schema
faculty (Fid, Fname, Faddress,Fbranch)
b. Write a query to display structure of the table as faculty (Fid, Fname, Faddress, Fbranch,Fphone)
c. Write a query to display structure of the table as faculty (Fid, Fname,Fbranch)
d. Drop the tablefaculty

2. Queries on DML commands (Insert, update, Delete,select)

a. Create a table with the followingschema
Storeinfo (storename, sales, txn_date, storeaddress)
b. Insert 10 rows in to thetable
c. Insert 15 rows into the table using single insertstatement
d. Write a query to change the sales of Levis store from 20% to30%
e. Write a query to change the address of VanHeusen store to 40-32, Himayat Nagar,Hyderabad.
f. Write a query to delete the details of Levisstore.
g. Write a query to delete the details of a store with address 20/35,Ameerpet
h. Write a query to display all the details ofstoreinfo.
i. Write a query to retrieve the details of Levisstor

Queries on DCL, TCL commands and computations onqueries

DCL(Grant,Revoke)

j. Write queries to create a role called as testing and create permission totesting
k. Write queries to revoke a create table privilege from testing role and drop the testingrole.

TCL(Commit,Rollback,Savepoint)

a. Perform commit operation to save the changespermanently
b. Create a schema student(sid,sname) with 3 rows initially.Later insert 3 rows with 3 savepoints.
c. perform rollback to savepoint B, savepointA.

3. Commands on key-constraints (NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, CHECK)

a. Create a table persons (id, fname, lname, age) where the null values should not be allowed while inserting the rows in idcolumn.
b. Create a table persons such that all the values in column id aredifferent.
c. Create a table student such that the column student id should not allow null values and duplicate values
d. Create a table persons (pid, fname, lname, age) and orders (id, ordernumber,pid).
e. Write a query to retrieve the ordered, ordername of a person with id3.
f. Write a query to retrieve age of a person whose order id is3.
g. Create a table votedetails (voterid, name, age, address) which does not allow the details of people whose age is<18.

4. Pattern matching queries and SQL queries using oraclefunctions

a. Write a query (WAQ) to retrieve the names of students whose names start with“S”.
b. Write a query to retrieve the names of the students whose names end with“a”.
c. Write a query to retrieve the names of the students whose names start with“ca”.
d. Write a query to retrieve the names of the students whose names consists of“ee”.
f. WAQ to concatenate 2strings
g. WAQ to set the first character in uppercase and rest in lowercase
h. WAQ to display the location of DER in“Hyderabad”.
i. WAQ to return the length of a stringengineering.
j. WAQ to convert all letters in a string “HYDERABAD” to lower case and upper casealso
k. WAQ to add NEW to the word HYDERABAD and NAWABS toHyderabad.
l. WAQ to extract base from Data base Managementsystems
m. Write query to count number of students in studenttable
n. Write queries to demonstrate CEIL, FLOOR, GREATEST, LEAST, MAX, MIN,SUM.
o. Write queries to demonstrate date functions like ADD_MONTHS, CURRENT_DATE, LAST_DAY, MONTHS_BETWEEN, NEXT_DAY, ROUND, SYSDATE,SYSTIMESTAMP.

5. Implementing Group By, Having, Order by clause

Task 1:

Create a table Northzone (custid, custname, address, city, country)
a. WAQ to display the number of customers in eachcountry.
b. WAQ to display the number of customers in each country in descendingorder
c. Create a table Northzone (custid, custname, age, address, city,country)
WAQ to display the number of customers in each country whose age is greater than 30.

Task 2:

For the schema student

a. WAQ to display number of students in eachsection
b. WAQ to display names of students in descendingorder
c. WAQ to display the names of students in each section whose percentageis>65.

6. Queries on joins (INNER, LEFT OUTER, RIGHT OUTER, FULLJOINS)

a. Create a tableorders(orderid,custid,orderdate)
b. Create a tablecustomers(custid,cname,country)
perform all join operations on the given two tables based on conditions.

7. Sub-Queries

a. WAQ to display list of children taller than 'myke' from heighttable.
b. WAQ to display the names of children who are taller and older than'Jim'
c. WAQ to get the names of the employees who work in department with the highestbudget.
d. WAQ to display the names of students whose percentage is greater than65
e. WAQ to display the names of the employees whose salary is greater than the average of allsalaries.
f. WAQ to demonstrate ALL,ANY.

8. Operations on views (Insert, Update, Delete),sequences

a. Create a students above 65 with the detailssid,sname,sphone,smailid
b. WAQ to change the phone number of a student whose name is 'XYZ' in students above 65view.
c. WAQ to drop students above 65view.
d. WAQ to delete the students details whose sid is 123 from students above 65view.

9. Sequences

a. Create a sequence seq1 for a table class which starts with 1 increament by1 and max value is 999 with cycle and withoutcycle.
b. Insert the values into class usingnextval.

10. Synonyms, Cluster and Index

a. Create a synonym for the product table in Adventure works2012
b. Create a cluster named personnel with a cluster key column department and a size of 512bytes.
c. Create an index on the cluster key ofpersonnel.

11. Introduction to basics of pl/sqlprogramming

a. Write a program to print'Hello'.
b. Write a program to add 2numbers
c. Write a program to print greatest of 3numbers.

12. Sample Programs inPL/SQL

a. Write a program to demonstrate basic loop, for loop, whileloop
b. Write a program to demonstrate insert, update, delete and select usingpl/sql.

Week 10, 11, 12: Mini Project

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	H	L	-	-	-	-	-	-	-	-	-	H	-	-
CO2	H	M	-	-	-	-	-	-	-	-	-	-	H	-	-
CO3	-	L	H	M	L	-	-	-	L	-	-	-	L	H	-
CO4	-	L	M	-	H	L	L	-	L	-	-	-	L	H	-

19CSP06: MATHEMATICAL TOOLKIT LAB

Credits–1 **Sessional Marks:40**
L:T:P::0:0:2 **University Exam Marks:60**

Course Objectives
To expose the students to the following:
1. Learn the MATLAB environment and its programmingfundamentals.
2. Write Programs using commands andfunctions.
3. Handle polynomials, and use 2D Graphiccommands.

Course Outcomes
On successful completion of course the students should be able to
CO1. Express programming & simulation for engineering problems.
CO2. Understand importance of this software for LabExperimentation.
CO3. Articulate importance of software's in research by simulation work.
CO4. Write basic mathematical, electrical, electronic problems in Matlab.

LIST OF PROGRAMS

1. Practicing MATLAB environment with simple exercises to familiarize Command Window, History, Workspace, Current Directory, Figure window, Edit window, Shortcuts, Helpfiles.
2. Data types, Constants and Variables, Character constants, operators, Assignmentstatements.
3. Control Structures: For loops, While, If control structures, Switch, Break, Continuestatements.
4. Functions: Input-Output functions, Reading and Storing Data, subfunctions, scope, advantages of functions, scripts, problemsolving
5. Vectors and Matrices, commands to operate on vectors and matrices, matrixManipulations.
6. Arithmetic operations on Matrices, Relational operations on Matrices, Logical operations on Matrices.
7. Polynomial Evaluation, Roots of Polynomial, Arithmetic operations onPolynomials.
8. Graphics: 2D plots, Printing labels, Grid & Axes box, Text in plot, Bar and Piechart.
9. File I/O: File input/output, excel files, text files, binaryfiles
10. Introduction to usage of any networksimulator
11. Implementation of queuing models usingC/C++
12. Data Analysis and visualization: acquiring data, analysing data, visualizingdata

Text Books
1. Bansal R.K, Goel A.K., Sharma M.K., "MATLAB and its Applications in Engineering", Pearson Education, 2012.

Reference Books
1. Amos Gilat, "MATLAB-An Introduction with Applications", Wiley India,2009.
2. Stephen.J.Chapman, "Programming in MATLAB for Engineers", Cengage Learning,2011.

Web References
1.https://in.mathworks.com/help/matlab/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	M	M	L	L	-	-	L	-	-	-	-	M	H	-
CO2	-	L	-	-	M	-	-	L	-	-	-	-	H	L	-
CO3	-	L	H	L	L	-	-	L	-	-	-	-	M	H	-
CO4	-	L	-	M	L	-	-	L	-	-	-	-	M	H	-

B.Tech
III Year I Semester

B.Tech III Year I Semester

S.No	Course Code	Course Title
1	19CST09	Design and Analysis of Algorithms
2	19CST10	Operating Systems
3	19CST11	Compiler Design
4	19CST12	Software Engineering
5	19BST10	Entrepreneurship & Project Management
6	**Elective – I**	
19CST18		System Programming
19CST19		Software Project Management
19CST20		Neural Networks
7	19BST11	Constitution of India
8	19CSP07	Operating Systems Lab
9	19CSP08	Software Engineering and Object Oriented Analysis and Design Lab

19CST09: DESIGN AND ANALYSIS OF ALGORITHMS

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Knowledge in analysing the efficiency and performance ofalgorithms.
2. Write rigorous correctness proofs foralgorithms.
3. Demonstrate major algorithms and data structures.
4. Concepts in algorithmic design paradigms and methods ofanalysis.
5. Synthesize efficient algorithms in common engineering designsituations.

Course Outcomes

After successful completion of course the students should be able to

CO1. Understand the fundamental concepts of various algorithms.
CO2. Analyse the performance of algorithms.
CO3. Apply appropriate algorithm design techniques for solving real time problems.
CO4. Choose the algorithmic design methods to test the impact on performance of algorithms.
CO5. Evaluate tractable and Intractable Problems.

UNIT I

Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behaviour; Performance measurements of Algorithm, randomized algorithms.

Divide and Conquer: General method, Binary Search, Merge sort, Quick Sort, Strassen's matrix multiplication.

UNIT II

Greedy Method: General method, Minimum cost Spanning Trees, Knapsack problem

Dynamic Programming: General Method, Optimal binary search trees, 0/1 knapsack, The travelling sales person problem.

UNIT III

Graph and Tree Algorithms: Techniques for binary trees, Techniques for Graphs, connected components and Spanning trees, Bi-connected components and DFS

Back tracking: General Method, 8 – queens problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles

UNIT IV

Branch and-Bound: The method, Travelling salesperson, 0/1 Knapsack problem, Efficiency considerations.

UNIT V

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques

Textbooks

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", 4th Edition, MIT Press/McGraw-Hill, 2014.

2. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, “Fundamentals of Computer Algorithms”, Second Edition, Universities Press,2008.

Reference Books

1. Jon Kleinberg and Eva Tardos, “Algorithm Design”, 1st Edition, Pearson,2013.
2. Michael T Goodrich and Roberto Tamassia, “Algorithm Design: Foundations, Analysis, and Internet Examples”, Second Edition, Wiley, 2006.
3. UdiManber, “Algorithms—A Creative Approach”, 3rd Edition, Addison-Wesley,2000.

Web References

1. https://nptel.ac.in/courses/106/106/106106131/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	-	-	-	-	-	-	-	-	H	-	-
CO2	-	H	-	-	-	-	-	-	-	-	-	-	H	-	-
CO3	-	-	-	M	-	-	-	-	L	-	-	M	H	M	L
CO4	-	-	H	-	-	-	-	-	-	-	-	-	H	M	L
CO5	-	H	M	-	-	-	-	-	-	-	-	-	H	M	L

19CST10: OPERATING SYSTEMS

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. The basic concepts of Operating System, its functions andservices.
2. The functionality of CPU Scheduling, Processes andThreads.
3. Various views and management policies adopted by OS as pertaining with processes, Deadlock, memory.
4. Fundamental concepts towards File and I/Ooperations.

Course Outcomes

After successful completion of course the students should able to

CO1. Understand the fundamental concepts of operating systems and its structure, processes and threads.
CO2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, and Response Time.
CO3. Analyze the memory management techniques.
CO4. Apply page replacement algorithms to resolve the issues in virtual memory.
CO5. Acquire the knowledge on files and I/O management system.

UNIT I

Introduction and Operating System Structure: Operating-System Structure, Operating-System Operations, Protection and Security, Kernel Data Structures, Computing Environments, Open-Source Operating Systems, Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Operating-System Debugging, Operating-System Generation, System Boot

UNIT II

Process Management: Processes: Process Concept, Process Scheduling, Operations on Processes Inter-process Communication, Examples of IPC Systems, Communication in Client– Server Systems Threads: Overview, Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues. CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling, Operating-System Examples, Algorithm Evaluation

UNIT III

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.
Memory Management: Main memory: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, structure of the Page Table
Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory

UNIT IV

Storage management: Mass-Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure
File-System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection.

UNIT V

File-System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery,NFS

I/O Systems: Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations, STREAMS.

Text Books

1. Silberschatz and Galvin John, "Operating Systems Concepts", 9th Edition, Wiley ,2013.

Reference Books

1. Williams Stallings, "Operating Systems", Second Edition, PHI, 1997.
2. Ida M. Flynn and Ann Mclver Mc Hoes, "Understanding Operating Systems", 7th Edition, Delmar CengageLearning,2013.
3. Charles Crowley, "Operating System: A Design-oriented Approach", 1st Edition, Irwin Publishing 1997.

Web References

1. https://nptel.ac.in/courses/106/106/106106144/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	-	-	-	-	-	-	H	-	-
CO2	M	M	H	L	-	-	-	-	-	-	-	-	M	H	L
CO3	M	H	-	L	-	-	-	-	-	-	-	-	H	M	-
CO4	-	H	M	M	-	-	-	L	-	-	-	-	M	H	L
CO5	H	M	L	-	M	-	-	-	-	-	-	-	H	-	-

19CST11: COMPILER DESIGN

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Basic concepts of Compiler designphases.
2. Knowledge about lexicalanalysis.
3. Design top-down and bottom-upparser.
4. Identify synthesized and inherited attributes and develop syntax directed translationschemes.
5. Develop algorithms to generate code for a targetmachine.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire knowledge in different phases and passes of Compiler, and specifying different types of tokens by lexical analyser, and also able to use the Compiler tools like LEX, YACC, runtime environment, etc.
CO2. Perform parsing using various parsing techniques.
CO3. Develop programs by Syntax directed translation using synthesized and inheritedattributes.
CO4. Use the tools related to compiler design effectively andefficiently.
CO5. Write intermediate code, optimized code and generate the appropriate target code.

UNIT I

Introduction to Compilers: A Language Processing System, Cousins of Compiler, Phases of a compiler, grouping of the phases into passes, Bootstrapping, Compiler Construction Tool.
Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Specification of Tokens, Strings and Languages, Operation on Languages, Regular Expressions, Recognition of Tokens, Transition Diagrams, lexical analyzer generator LEX, Design of a Lexical Analyzer generator.

UNIT II

Syntax Analysis: Introduction to Syntax Analyzer, Formal definition of CFG, Parse Trees and Derivations, Elimination of Ambiguity, Elimination of Left Recursion, Left Factoring, Top down Parsing, Bottom up Parsing, Operator-Precedence Parsing, Construction of Simple LR Parsing Table, More Powerful LR Parsers, Using ambiguous grammars, Parser Generators.

UNIT III

Syntax-Directed Translator: Syntax-Directed Definitions, Evaluation Orders for SDD's, Construction of Syntax Trees, Parser Stack Implementation of Postfix SDT's, Bottom-Up Parsing of L-AttributedSDD's.

UNIT IV

Intermediate Code Generation: Direct Acyclic Graph, Three Address Code, Type Expressions, Type Equivalence, Declarations, Type Checking, Type Conversions, Over Loading of Functions and Operators, Type Inference and Polymorphic Functions, Boolean expressions, Switch –Statements, Procedures.
Run-Time Environments: Storage Organization, Stack Allocation of Space, Access to Non-local Data on the Stack, Heap Management.

UNIT V

Code Optimization& Generation: The principal sources of optimization, Issues in the Design of a Code Generation, The Target Language, Address in the Target Code, Basic blocks and flow graphs, Optimization of Basic blocks, A simple code generator, Register allocation and assignment.

Text Books

1. Alfred V.Aho, Monica S.Lam,Ravi Sethi, Jeffrey D Ullman, "Compilers – Principles, Techniques and Tools", Third Edition, Pearson Education, 2018.

Reference Books

1. Alfred V.Aho, Ravi Sethi, Jeffrey D Ullman, "Principles of Compiler Design", Second Edition,Narosa publications,2002.
2. J.P.Benne, "Introduction to Compiling Techniques", Second edition, Tata McGraw-Hill2000.
3. Kenneth C Louden, "Compiler Construction-Principles and Practice", Thomson Press (India) Ltd, 1997.

Web References

1. https://nptel.ac.in/courses/106/105/106105190/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	-	-	-	-	-	-	-	-	H	M	-
CO2	-	-	H	-	M	-	-	-	L	-	-	-	H	M	L
CO3	-	-	H	-	L	-	-	M	-	-	-	-	M	H	-
CO4	-	-	M	-	H	-	-	-	-	-	-	-	-	H	-
CO5	-	L	H	M	-	-	-	-	-	-	-	-	L	H	-

19CST12: SOFTWARE ENGINEERING

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Understand the concepts all software processmodels.
2. Knowledge about umbrella activities involved in Softwaredevelopment.
3. Learn various software architecturalstyles.
4. Discuss the concepts of different software testingapproaches.
5. Acquire knowledge about quality control and ensure good qualitysoftware.

Course Outcomes

After successful completion of course the student should be able to

CO1. Learn the concepts of software development life cycle models.
CO2. Develop correct and robust software products by gathering requirements.
CO3. Analyse various metrics for estimation of software.
CO4. Manage and maintain Software Project to ensure good quality software with high reliability.
CO5. Gain knowledge in different Key Process Areas like planning and estimation of softwareprojects, the implementation issues, and validation and verification procedures.

UNIT I

Software and Software Engineering: The Nature of Software, The Unique Nature of Web Apps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths.

Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process.

Agile Development: Agility, Agility and the Cost of Change, Agile Process, Extreme Programming, Other Agile Process Models

UNIT II

Software Measurement: process metrics, project metrics, and product metrics for Software quality, integrating metrics with the software process.

Software Project Planning: Software Project Estimation, Decomposition Techniques and Estimation models, Software Risk Management, Project Scheduling and Tracking, Software Quality Assurance, Reliability, Software Configuration Management.

UNIT III

Requirements Engineering: Establishing the Groundwork, Eliciting Requirements, developing use cases, Building the requirements model, Negotiating, Validating Requirements.

Requirements Modeling (Scenarios, Information and Analysis Classes): Requirements Analysis, Scenario-Based Modeling, UML Models that Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling.

Requirements Modeling (Flow, Behavior, Patterns and WEBAPPS): Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirements Modeling for WebApps.

UNIT IV

Design Concepts: Design with Context of Software Engineering, The Design Process, Design Concepts, The Design Model.

Architectural Design: Software Architecture, Architecture Genres, Architecture Styles, Architectural

Design, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow.
Component-Level Design: Component, Designing Class-Based Components, Conducting Component-level Design, Component Level Design for WebApps, Designing Traditional Components, Component-Based Development.
User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation.

UNIT V

Software Testing:Software testing fundamentals, Text Case designs, and Testing approaches, strategies. Clean Room Software Engineering, Component based software engineering, client/Server Software Engineering, Web engineering, Reengineering.

Text Books

1. Roger S. Pressman, "Software engineering A practitioner's Approach", Seventh Edition, McGraw Hill International Education, 2016.

Reference Books

1. Rajib Mall, "Fundamentals of Software Engineering", Fourth Edition, PHI Learning,2017.
2. IAN Sommerville, "Software Engineering", Ninth Edition, Pearson,2011.
3. PankajJalote, "Software Engineering, A Precise Approach", Wiley India,2010.

Web References

1. https://nptel.ac.in/courses/106/105/106105182/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	-	-	-	-	-	-	-	-	H	-	-
CO2	-	M	H	-	-	-	-	-	-	-	-	-	H	M	-
CO3	-	H	-	M	-	-	-	-	-	-	-	-	H	-	-
CO4	-	-	-	-	-	-	-	-	-	H	M	L	H	-	-
CO5	H	-	-	-	-	H	-	-	-	-	-	-	H	-	-

19BST10: ENTREPRENEURSHIP & PROJECT MANAGEMENT

Credits – 3 **Sessional Marks: 30**
L:T:P::3:0:0 **University Exam Marks: 70**

Course Objectives

1. To understand the principles & phases of projects
2. To identify the resources of the project & duration.
3. To know the role entrepreneurship in economic development
4. To understand the problems of SSE
5. To learn the design & preparation of business plan.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Define the concepts of project, engineering project design, and prototyping and feasibility study
CO2. Evaluate product duration, cost & quality control charts
CO3. Identify the ways to enhance economic development
CO4. Capable to maintain the problems of SSE and SWOT analysis
CO5. Design the business plan

UNIT I

Project Management: Concept of project - Project Life Cycle Phases – Human centred Engineering Project Design – Design thinking – Principles – Preliminary project specification – Feasibility Study – Detailed Project Design - Prototyping Methods – Validation of project with users.

UNIT II

Project Evaluation Techniques:PERT - CPM - Statistical Quality Control: X & R charts, P & C charts - Report preparation - Incubation – Concept – Support System.

UNIT III

Introduction to Entrepreneurship: Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs Manager, Entrepreneur vs Entrepreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development – Problems faced by women entrepreneurs – Support System for entrepreneurs.

UNIT IV

Small Scale Enterprise: Definition, Characteristics, Role of Small Enterprise in Economic Development, Problems of SSE, and Steps involved to start SSE, Package for promotion of Small Scale Enterprise, SWOT Analysis.

UNIT V

Business Model Design: Innovation readiness to commercialisation – Business Plan Preparation - Venture capital support system – Start-up support system and Review of Indian start-up business models.

Reference Books

1 L.S. Srinath, PERT/CPM, Affiliated East-West Press, New Delhi , 2002
2 S. Choudary, Project Management, McGraw Hill Education (India) Private Limited, New Delhi.
3 S.S.Khanka, Entrepreneurial Development, S Chand & Company Ltd., New Delhi.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					**M**		**L**					
CO2					**M**						**H**	**L**
CO3									**L**			
CO4				**M**					**M**			**L**
CO5					**H**				**M**		**H**	**L**

ELECTIVE - I

19CST18: SYSTEM PROGRAMMING

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following
1. Basic concepts of operating systems and ComputerArchitecture.
2. Design of operating systems and systemsoftware's.
3. Learn the functioning of the principal parts of an operatingsystem.
4. Design of Devicedrivers.

Course Outcomes

After successful completion of course the student should be able to
CO1. Demonstrate the ability to think critically and analyze system problems.
CO2. Understand SIC, SIC/XE architectures.
CO3. Demonstrate the ability to analyze, design programs to demonstrate basic knowledge of systems software and operating systems.
CO4. Formulate simple algorithms for Assemblers, Loaders and Macro processors.
CO5. Interpret Character device drivers and Block device drivers.

UNIT I

Machine Architecture: System Software and Machine Architecture, the Simplified Instructional Computer (SIC), SIC Machine architecture, Data and Instruction Formats, addressing modes, instruction sets, I/O and programming.

UNIT II

Basic Assembler Functions: A Simple SIC Assembler, Assembler Algorithm and Data Structures, **Machine-Dependent Assembler:** Features, Instruction Formats and Addressing Modes, Program Relocation

Machine Independent Assembler: Features, Literals, Symbol, Defining Statements, Expressions, One-Pass Assemblers, Multi-Pass Assemblers, Implementation Example - MASM Assembler.

UNIT III

Loaders and Linkers: Basic Loader Functions, Design of an Absolute Loader, A Simple Bootstrap Loader

Machine-Dependent Loader Features: Relocation, Program Linking, Algorithm and Data Structures for Linking Loader

Machine Independent Loader Features: Automatic Library Search, Loader Options, Loader.

Design Options: Linkage Editors, Dynamic Linking, Bootstrap Loaders, Implementation Example – MS-DOS Linker.

UNIT IV

Macro Processors: Macro Instructions, Features of a Macro Facility- Macro Instruction Arguments, Conditional Macro Expansion, Macro Calls within Macros, Macro Instructions Defining Macros, Implementation-Implementation of a Restricted Facility: A Two-Pass Algorithm, A Single-Pass Algorithm.

UNIT V

Block Drivers I: A Test Data Generator-Design Issues, Driver.
Block Drivers II: A RAM Disk Drive-Design Issues, Driver.
Block Drivers III: A SCSI Disk Driver -Design Issues, Driver.

Text books

1. Leland L. Beck, "System Software – Introduction to Systems Programming", Third Edition, Pearson Education Asia,1997.
2. George Pajari, "Writing UNIX Drivers", First Revised Edition, Addison-Wesley,2014.

Reference Books

1. D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill, 2015.

Web References

1.https://www.youtube.com/watch?v=MylrhAMmNRY

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	H	-	-	-	-	H	-	-	-	H	-	H	-	-
CO2	-	-	-	-	H	-	M	-	-	-	L	-	H	-	-
CO3	-	M	L	H	-	-	-	-	-	-	-	-	H	M	-
CO4	-	H	L	-	-	-	-	-	-	-	-	-	H	L	-
CO5	-	-	-	H	-	-	-	-	-	-	-	-	H	-	-

19CST19: SOFTWARE PROJECT MANAGEMENT

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Learn all the Principles and Practices involved in Software ProjectManagement.
2. Make estimations for different softwareprojects.
3. How to schedule various activities in the project, manage and monitor the risks encountered in the softwareprocess.
4. Reengineering and restructuring concepts for the Software Development andMaintenance.
5. Recent developments in softwareengineering.

Course Outcomes

After successful completion of course the student should be able to

CO1. Analyse the issues and challenges faced while managing the software project, various estimation techniques.
CO2. Evaluate the defect removal efficiency for achieving high quality software.
CO3. Understand the concepts of project scheduling, tracking, Risk analysis, Quality management and Project estimation using different techniques.
CO4. Identify project goals, constraints, deliverables, performance criteria, control needs and resource requirements in consultation with stakeholders.
CO5. Demonstrate the trends and techniques involved in software project management.

UNIT I

Project Management concepts: The Management Spectrum—People, The Product, The Process, The Project; WHH principle, Critical practices.

Process and Project Metrics: Introduction, Software measurement, Software Quality Metrics, Integrating Metrics within the software process, Metrics for small organization.

UNIT II

Estimation for Software Projects: Introduction, Project planning process, software scope and feasibility, Resources, Software Project Estimation, Decomposition techniques, Empirical estimation models, Estimation for object-oriented projects, specialized estimation techniques, the make/buy decision.

UNIT III

Project Scheduling: Basic concepts, Principles, defining a task set for software project, defining a task network, Scheduling, Earned valueanalysis.

Risk Management: Reactive versus Proactive risk strategies, Software risks, Risk Identification, Risk projection, Risk Refinement, Risk Mitigation, Monitoring and Management, RMMM plan.

UNIT IV

Maintenance and Reengineering: Software maintenance, Software Supportability, Reengineering, Business Process Reengineering, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering, Economics of Reengineering.

UNIT V

Emerging trends in software Engineering: Technology Evolution, Software Engineering Trends, Identifying Soft Trends, Technology Directions, Tools-related Trends.

Textbooks

1. Pressman R S, "Software Engineering—A Practitioner's Approach", 7th edition, McGraw Hill, 2017

Reference Books

1. Jacobson I, Christeron M, Jonsson P, "Object Oriented Software Engineering: A Use Case Driven Approach", Pearson 2015.

Web References

1. https://nptel.ac.in/courses/106/105/106105218/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	H	M	-	L	-	-	-	-	-	-	-	H	-	-
CO2	-	-	-	-	H	L	-	-	M	-	-	-	H	-	-
CO3	-	M	L	-	-	-	-	-	H	-	-	-	H	-	L
CO4	H	M	L	-	-	-	-	-	-	-	-	-	H	-	-
CO5	L	-	-	H	-	-	M	-	-	L	-	-	H	-	-

19CST20: NEURAL NETWORKS

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. The basic concepts of Artificial Neural Networks and architectures.
2. Various methods of representing information inANN.
3. Various architectures of building an ANN and its applications.
4. Pattern classification and Pattern Associationtechniques.

Course Outcomes

After successful completion of course the student should be able to

CO1. Analyse simple neural nets for pattern classification.
CO2. Understand the Pattern Association and its applications.
CO3. Apply contextual knowledge to solve problems related to vector Quantization.
CO4. Devise the algorithms using Adaptive Resonance operations.

UNIT I

Introduction: Definition of ANN, Biological Neural Networks, Applications of ANN, Typical Architectures, Setting the weights, Common Activation functions, Development of Neural Networks, McCulloch-Pitts Neuron.

UNIT II

Simple Neural Nets for Pattern Classification: General discussion, Hebb net, Perceptron, Adaline, Back propagation neural net, Architecture, Delta Learning Rule Algorithm, Applications.

UNIT III

Pattern Association: Training Algorithm for Pattern Association-Hetero associative memory neural network applications, Auto associative net, Iterative Auto associative net Bidirectional Associative Memory, Applications.

UNIT IV

Neural Nets Based on Competition: Fixed Weights Competitive Nets, Kohonen's Self-Organizing Map, Applications Learning Vector Quantization, Applications, Counter Propagation Network Applications.

UNIT V

Adaptive Resonance Theory and Neocognitron: Motivation – Basic Architecture, Basic Operation, ART1-ART2-ArchitectureAlgorithm, applications, Analysis, Probabilistic Neural Net, Cascade Correlation Neocognitron: Architecture, Algorithm and Applications.

Text Books

1. Laurene V. Fausett, "Fundamentals of Neural Networks-Architectures, Algorithms and Applications", Pearson Education,2011.

Reference Books

1. James. A. Freeman and David. M. Skapura, "Neural Networks Algorithms, Applications and Programming Techniques", Sixth Reprint, Pearson Education,2011.
2. Simon Haykin, "Neural Networks and Learning Methods", PHI Learning Pvt. Ltd.,2011.
3. James A. Anderson, "An Introduction to Neural Networks", PHI Learning Pvt. Ltd.,2011.

Web References

1.https://www.youtube.com/watch?v=d14TUNcbn1k

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	H	-	L	-	-	-	-	-	-	-	-	H	L	L
CO2	H	-	-	-	-	-	-	-	-	-	-	-	H	-	L
CO3	-	-	H	-	-	-	-	-	-	-	-	-	H	-	L
CO4	-	-	H	-	M	-	-	-	-	-	-	-	L	H	-

19BST11: CONSTITUTION OF INDIA

Credits – No credits
L:T:P::3:0:0

Course Objectives

1. To learn basic concepts of Indian Constitution.
2. To understand Fundamental Rights, Fundamental Duties and its implications.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire the knowledge of Indian constitution.

CO2. Understand the Fundamental Rights, Directive Principles of State Policies and Fundamental Duties.

UNITI

Constitution-structure and principles: Meaning and importance of Constitution, making of Indian Constitution, salient features of Indian constitution.

UNITII

Fundamental Rights and Directive Principles of State Policy: Fundamental Rights , Fundamental Duties, Directive Principles.

UNITIII

Government of the Union: President of India – election, powers and functions, Prime Minister and Council of Ministers, Loksabha - composition and powers, Rajyasabha -composition and powers.

UNITIV

Government of states: Governor - powers and functions, Chief Minister and Council of Ministers, Legislative Assembly and Legislative Council.

UNITV

Judiciary: Features of Judicial System in India, Supreme Court, High court- structure and Jurisdiction.
Administrative Organizations and Construction: Federalism in India, local government –panchayat, election commission, citizen oriented measures - RTI and PIL significance and provisions.

Text Books

1. HM Seervai ,"Constitutional Law of India",Universal Law Publishing Co Ltd
2. Parvinrai Mulwantrai Bakshi, Constitution of India, LexisNexis,2019.

Reference Books

1. Dr.J.N.Pandey," Constitutional Law Of India", Central Law Agency,Allahabad, 2019
2. Durga Das Basu, Shorter Constitution of India,LexisNexis, 2019.

19CSP07: OPERATING SYSTEMS LAB

Credits–1 **Sessional Marks:40**
L:T:P::0:0:2 **University Exam Marks:60**

Course Objectives

To expose the students to the following:

1. Various CPU scheduling algorithms and file allocationmechanisms.
2. Simulate file organization strategies, page replacement algorithms, deadlock avoidance and preventionalgorithms.

Course Outcomes

After successful completion of the course students should be able to

CO1. Develop synchronized programs using multithreading concepts and deadlocks.
CO2. Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
CO3. Implement memory management schemes and page replacement schemes,
CO4. Design file management techniques

LIST OF PROGRAMS

1. Implement the following scenario(RR)
   Each customer comes to bank in order to deposit (process) some amount. Now the bank manager decides that no customer will starve (waiting in queue for indefinite time) and each customer must get chance to deposit its amount. For this, he creates some rules
   a. There will be a queue. Whoever wants to deposit its cash must stand in queue first. By analogy, if there is a process,which wants to execute, it must be inqueue.
   b. There will be a certain amount "A ",fixed by Manager, which is the **maximum** amount, a customer can deposit at a time. If total amount of customer is greater than A, then customer will leave cashier counter and again stand in Queue and wait for its turn. However, if total amount is less than A, then after deposit, customer will leave cashier counter and get out of bank immediately and next customer from queue will deposit his amount next from that point oftime.
2. Implement the SJF schedulingalgorithm.
3. Implement the followingscenario(FCFS)
   When he/she went for buying the tickets at a movie theatre.
4. Implement the following scenario(priority)
   When you want to watch a movie based on your priority using a pendrive in which there are 10 movies
5. Implement the following scenario using sequential file allocationstrategy
   Seats allocated for students in an examinationhall
6. Implement the following scenario
   Books arranged in the library, using Indexed file allocation strategy
7. Implement the following scenario using Linked File allocationstrategy
   When a viewer goes to the movie theatre how he will find his seat number, first he will extract the alphabet series then he needs to go through the series to get the seatnumber.
8. Implement how will you organize your files in the documents directory in your pc(File organization using single leveldirectory)
9. Implement how will you organize your files by using a specific folder in the documents directory in your pc(File organization using two leveldirectory)
10. Create the folder MyMusic in which subfolders will be there namely " Artist","format"
    Artist folder consists of the following sub folders of music year, album, format, song and format folder will have the following subfolders year, artist, album, song(File organization using Hierarchical technique)

11. Consider the following reference string to perform the FIFO page replacement 0, 2, 1, 6, 4, 0, 1, 0, 3, 1, 2, 1 Number of frames =3
12. Consider the following reference string to perform the LRU page replacement 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2 Number of frames =3
13. Consider the following reference string to perform the LRU page replacement 7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1 Number of frames =3
14. Simulate banker's algorithm for Deadlockavoidance.
15. Simulate bankers algorithm for DeadlockPrevention

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	L	M	H	-	-	-	-	L	-	-	-	-	M	H	-
CO2	-	H	M	M	-	-	-	L	-	-	-	-	M	H	-
CO3	M	-	H	-	M	-	-	L	-	-	-	-	M	H	-
CO4	M	-	H	-	L	-	-	L	-	-	-	-	M	H	-

19CSP08: SOFTWARE ENGINEERING AND OBJECT-ORIENTED ANALYSIS AND DESIGN LAB

Credits–1 **Sessional Marks:40**
L:T:P::0:0:2 **University Exam Marks:60**

Course Objectives

To expose the students to the following:

1. Practice the notation for representing various UMLdiagrams.
2. The software engineering methodologies for projectdevelopment.

Course Outcomes

After successful completion of course the student should be able to

CO1. Find solutions to the problems using object-oriented approach.
CO2. Represent using UML notation and interact with the customer to refine the UML diagrams.
CO3. Develop a software project from requirements gathered to implementation.
CO4. Obtain knowledge about principles and practices for estimation and maintenance of software systems.
CO5. Focus on the fundamentals of modelling a software project.

LIST OF EXPERIMENTS

Prepare the following documents for each experiment

1. Develop the software using Software engineeringmethodology
   a. Problem Analysis and Project Planning – Thorough study of the problem – Identify Project scope, Objectives andInfrastructure.
   b. Software Requirement Analysis – Describe the individual Phases/modules of the project and Identifydeliverables.
   c. Data Modelling - Use work products – data dictionary, use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class Diagrams.
   d. Software Development and Debugging – implement the design bycoding
   e. Software Testing- Prepare test plan, perform validation testing, coverage analysis, memory leaks, develop test case hierarchy, Site check and sitemonitor.

2. Develop UMLdiagrams.
   a. Use CaseDiagram.
   b. ClassDiagram.
   c. SequenceDiagram.
   d. CollaborationDiagram.
   e. StateDiagram
   f. ActivityDiagram.
   g. ComponentDiagram
   h. DeploymentDiagram.
   i. TestDesign.

Applications that may be considered are:

1. College informationsystem
2. Hostelmanagement
3. ATMsystem
3. Online ticket reservationsystem
4. Airline ReservationSystem
5. Library ManagementSystem

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	-	H	-	M	-	-	M	-	-	-	-	M	H	L
CO2	L	-	H	-	M	-	-	M	-	H	-	-	M	H	-
CO3	-	-	H	-	M	M	-	M	-	-	L	-	M	H	L
CO4	H	-	-	-	M	L	-	M	-	-	-	-	H	L	-
CO5	H	-	-	-		L	-	-	-	-	-	-	M	H	-

B.Tech
III Year II Semester

B.Tech III Year II Semester

S.No	Course Code	Course Title
1	19CST13	Machine Learning
2	19CST14	Computer Networks
3	19CST15	Artificial Intelligence
4	**Elective – II**	
19CST21		Software Testing
19CST22		Data Mining
19CST23		Deep Learning
5	**Elective – III**	
19CST24		Cloud Computing
19CST25		Distributed Computing
19CST26		Big Data Analytics
6	**Open Elective – I**	
19CST33		Basics of Data Structures
19CST34		Introduction to C++ Programming
19CSP13		Advanced Programming Lab
19CST35		Fundamentals of Computer Organization
7	19CSP09	Machine Learning and Artificial Intelligence Lab
8	19CSP10	Computer Networks Lab

19CST13: MACHINE LEARNING

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Fundamental concepts in the area of machinelearning.
2. Describe the machine learning and decisions trees, Neural networks and geneticalgorithms.
3. Bayesian techniques, instant based learning and analytical learning and reinforcedlearning.

Course Outcomes

After successful completion of course the student should be able to

CO1. Familiarize with various types of machine learning algorithms and solve it.
CO2. Articulate how these algorithms are fundamentally different from traditional programming algorithms.
CO3. Practice the Bayesian and computational algorithms related to the real time application.
CO4. Implement the effective of analytical concepts, inductive analytical approaches and reinforced learning algorithms.
CO5. Construct various instant based learning and learning set of rules.

UNIT I

Introduction, Concept Learning and Decision Trees: Learning Problems, Designing Learning systems, Perspectives and Issues, Concept Learning, Version Spaces and Candidate Elimination Algorithm, Inductive bias, Decision Tree learning, Representation, Algorithm, Heuristic Space Search.

UNIT II

Neural Networks and Genetic Algorithms: Neural Network Representation, Problems, Perceptions, Multilayer Networks and Back Propagation Algorithms, Advanced Topics, Genetic Algorithms, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning.

UNIT III

Bayesian and Computational Learning: Bayes Theorem, Concept Learning, Maximum Likelihood, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier, Bayesian Belief Network, EM(Expectation-Maximization) Algorithm, Probably Learning, Sample Complexity for Finite and Infinite Hypothesis Spaces, Mistake Bound Model.

UNIT IV

Instant Based Learning and Learning Set of Rules: k- Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Sequential Covering Algorithms, Learning Rule Sets, Learning First Order Rules, Learning Sets of First Order Rules, Induction as Inverted Deduction, Inverting Resolution.

UNIT V

Analytical Learning and Reinforced Learning: Perfect Domain Theories, Explanation Based Learning, Inductive Analytical Approaches, FOCL (First Order Combined Learner) Algorithm, Reinforcement Learning, Task, Q-Learning, Temporal Difference Learning

Text Books

1. Tom M. Mitchell, “Machine Learning”, 1st Edition, McGraw-Hill, 2013

Reference Books

1. EthemAlpaydin, "Introduction to Machine Learning", 2nd Edition, MIT Press,2009.
2. Kevin P. Murphy, "Machine Learning, A Probabilistic Perspective", MIT Press,2012

Web References

1.https://nptel.ac.in/courses/106/106/106106202/
2.https://nptel.ac.in/courses/106/105/106105152/
3.https://nptel.ac.in/courses/106/106/106106139/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	H	-	M	-	-	-	L	-	H	-	-
CO2	H	-	M	-	-	-	-	-	-	-	-	-	H	-	-
CO3	L	-	-	-	-	H	M	-	-	-	-	-	L	H	M
CO4	L	-	-	-	-	-	-	-	H	M	-	L	L	H	M
CO5	L	-	-	-	-	-	-	-	-	-	-	H	M	L	H

19CST14: COMPUTER NETWORKS

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Modern network architectures from a design and performanceperspective.
2. Major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs(WLANs).
3. Impart skills in networkprogramming.
4. Define WLANmetrics.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand and explore the basics of Computer Networks and Various Protocols.
CO2. Administrate a network and schedule flow of information.
CO3. Examine the network security issues in Mobile and ad hoc networks.
CO4. Demonstrate the TCP/IP and OSI models with merits and demerits.
CO5. Evaluate the shortest path by using Routing algorithms.
CO6. Design the various layers protocols.

UNIT I

Introduction: Introduction to computer networks, network hardware, network software, Reference models, examples of networks, example of data communication services, network Standardization. Overview of Physical layer

Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, protocol specification and verification, examples of data linkprotocols.

UNIT II

Medium Access Sublayer: Channel allocation problem, multiple access protocols, IEEE standard 802 for LANs and MANs, Bridges, High-speed LANs, Satellite network.

UNIT III

Network Layer: Design issues, routing algorithms, congestion control algorithms, internetworking, the network layer in the internet, the network layer in ATMnetwork.

UNIT IV

Transport Layer: Transport services, elements of transport protocols, a simple transport protocol, the internet transport protocols, (TCP and UDP), the ATN ALL layer protocols, performance issues.

UNIT V

Application Layer: Network security, DNS – Domain Name System, SNMP –Simple Network Management protocol, Electronic Mail, Usenet news, the World Wide Web (WWW), Multimedia.

Textbooks

1. Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks”, 5th Edition, Pearson, 2011.

Reference Books

1. Behrouz A. Forouzan, “Data Communication and Networking”, 5th Edition, Tata McGraw Hill, 2013

Web References

1.https://nptel.ac.in/courses/106/105/106105081/
2.https://nptel.ac.in/courses/106/106/106106091/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	L	-	-	-	-	-	H	-	-
CO2	-	H	H	-	-	-	M	-	-	-	-	-	H	-	-
CO3	-	M	-	H	-	M	M	-	-	-	-	-	H	-	M
CO4	-	H	-	-	-	-	-	-	-	-	M	-	H	-	-
CO5	L	M	-	H	-	-	-	-	-	-	-	-	L	M	-
CO6	-	-	H	M	-	-	-	-	L	L	-	-	L	M	H

19CST15: ARTIFICIAL INTELLIGENCE

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. About various AI domains and problem solvingtechniques.
2. Basic proficiency in representing difficult real life problems in a state space representation so as to solve them by using AI techniques like searching and gameplaying.
3. The concept of Knowledge representations, its various approaches and issues, Non-monotonic environment and Symbolic Reasoning inUncertainty.
4. Formal foundation on Strong & Weak slot & fillerstructures.
5. An overview on Natural Language Understanding andprocessing.

Course Outcomes

After successful completion of course the student should be able to

CO1. Recognize various AI domains and identify problem solving techniques to apply them in real timeapplications.
CO2. Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
CO3. Represent Knowledge in propositional calculus and Predicate calculus.
CO4. Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
CO5. Get wide exposure about strong and weak slot & fillers available.
CO6. Gain an in-depth understanding of the computational properties of natural languages and the techniques for processing linguistic information.

UNIT I

Introduction to AI: The AI Problems-The Underlying Assumption-What is an AI Technique-Tic- Tac-Toe game playing, Problems, Problem Spaces and Search-Defining the problem as a State Space Search- Production Systems-Control Strategies-Heuristic Search, Issues in the design of search program.

Heuristic search techniques: Generate and Test, Hill Climbing-Simple Hill Climbing-Steepest Ascent Hill Climbing-Simulated Annealing, Best-first-search-OR Graphs, A* Algorithm, Agenda DrivenSearch.

UNIT II

Knowledge representation: Knowledge Representation Issues- Representations in Mappings, Approaches to Knowledge representation, Issues in Knowledge Representation.

Predicate logic: Representing simple facts in Logic, representing instance and isa Relationships, Computable Function and Predicates, Resolution-Conversion to Clause form-The basics of Resolution-Resolution in Propositional Logic-Resolution in Predicate Logic, Natural deductions.

UNIT III

Symbolic Reasoning under Uncertainty: Introduction to non-monotonic reasoning, logics for non-monotonic reasoning-Default Reasoning-Minimalist Reasoning, Implementation issues, Implementation in depth first search-Dependency directed Backtracking-Justification Based Truth Maintenance Systems-Logic-Based Truth Maintenance Systems- Implementation in Breadth first search.

UNIT IV

Weak slot and Filler Structures: Semantic Nets- Intersection Search-Representing Non-binary Predicates-Partitioned Semantic Nets, Frames-Frames as Sets and Instances-Slots as Full-Fledged Objects-Slot-Values as Objects-Inheritance Revisited.

Strong Slot and Filler Structures: Conceptual dependency.

UNIT V

Natural Language Processing: Introduction, Syntactic Processing-Grammars and Parsers-Top Down versus Bottom-Up Parsing-Finding one Interpretation or Many-Augmented Transition Networks-Unification Grammars, Semantic Analysis-Lexical Processing-Sentence-Level Processing-Semantic Grammars-Case Grammars-Conceptual Parsing-Approximately Compositional Semantic Interpretation-The interaction between Syntax and Semantics, Discourse and Pragmatic processing-Using Focus in Understanding-Modeling Beliefs-Using Goals and plans for Understanding-Speech acts-Conversational postulates.

Textbooks

1. Elaine Rich, Kelvin Knight and Shiva Shankar B.Nair, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill edition, July, 2017.

Reference Books

1. Saroj koushik, "Artificial Intelligence", 1st Edition, Engage learning,2011.
2. Elakumar, "Artificial Intelligence", 1st Edition, I. K. International publishing house,2010.

Web References

1.https://nptel.ac.in/courses/106/105/106105077/
2.https://nptel.ac.in/courses/106/105/106105079/
3.https://nptel.ac.in/courses/106/106/106106140/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	L	-	-	-	-	-	H	-	L
CO2	-	H	-	M	-	-	-	L	-	-	-	-	H	L	L
CO3	H	-	-	-	-	-	-	-	-	-	-	-	H	-	-
CO4	-	H	-	M	-	-	-	-	-	-	-	-	H	-	-
CO5	H	-	M	-	-	-	-	L	-	-	-	-	H	L	-
CO6	L	-	-	H	-	-	M	-	-	-	-	M	H	-	M

ELECTIVE - II

19CST21: SOFTWARE TESTING

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:
1. Learn Software Myths and Facts with their testing functioning ofManagement.
2. Analyse the various techniques to test the softwareproduct.
3. Collect metrics for themanagement.
4. Implementation of various RegressionTechniques.

Course Outcomes

After successful completion of course the students should be able to
CO1. Familiar about the processes involved in various testing methodologies.
CO2. Analyse the techniques in both structure and behaviour of the software.
CO3. Specify the design and analysis of steps in Software management.
CO4. Collection of metrics on various types of Environments.
CO5. Articulate how the Methods of Regression Test tools.
CO6. Various Test Processes and continuous Quality improvement.

UNIT I

Introduction to Software Testing: Evolution of Software Testing, Software Testing—Myths and Facts, Goals of Software Testing, Psychology for Software Testing, Software Testing Definitions, Model for Software Testing, Effective Software Testing vs. Exhaustive Software Testing. Effective Testing is Hard, Software Testing as a Process. Terminology & Methodology: Software Testing Terminology, Software Testing Life Cycle (STLC), Software Testing Methodology.

UNIT II

White Box Testing: Need of White-Box Testing, Logic Coverage Criteria, Basis Path Testing, Graph Matrices, Loop Testing, Data Flow Testing, Mutation Testing.

UNIT III

Black Box Testing: Boundary Value Analysis (BVA), Equivalence Class Testing, State Table-Based Testing, Decision Table-Based Testing, Cause Effect Graphing Based Testing, Error Guessing.

UNIT IV

Software Test Management & Metrics: Test Management: Test Organization, Structure of Testing Group, Test Planning, Detailed Test Design, Test Specifications. Software Metrics: Definition of Software Metrics, Classification of Software Metrics, Size Metrics.

UNIT V

Regression and Automation: Regression Testing: Progressive vs. Regressive Testing, Regression Testing Produces Quality Software, Regression Testability, Objectives of Regression Testing, Regression Testing Types, Defining Regression Test Problem, Regression Testing Techniques. Automation and Testing Tools: Need for Automation, Categorization of Testing Tools, Selection of Testing Tools, Costs Incurred in Testing Tools, Guidelines for Automated Testing, Overview of Some Commercial Testing Tools.

Text Books

1. Naresh Chauhan, “Software Testing: Principles and Practices”, 2nd Edition, Oxford University Press,2016.

Reference Books

1. Boris Beizer, “Software Testing Techniques”, 2nd Edition, Dream Tech Press,2004.

2. K. V. K. K. Prasad, “Software Testing Tools”, Dream Tech Press,2004.

Web References

1.https://nptel.ac.in/courses/106/105/106105150/
2.https://nptel.ac.in/courses/106/101/106101163/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	-	-	-	-	-	-	-	-	H	-	-
CO2	-	H	-	L	-	-	-	-	-	-	-	-	H	-	-
CO3	-	L	-	-	-	-	-	-	-	-	-	-	H	-	-
CO4	H	M	-	-	-	-	-	-	-	-	-	-	M	H	-
CO5	-	-	H	M	-	-	-	-	-	-	-	-	H	-	M

19CST22: DATA MINING

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. The basic concepts and techniques of data warehousing and datamining.
2. Various pre-processing techniques and data miningfunctionalities.
3. Several multidimensional models for datawarehousing.
4. The performance of Frequent Item sets and AssociationRules.
5. Different types of classification and clustering algorithms.

Course Outcomes

After the successful completion of course the students should be able to

CO1. Understand the basic concepts of data warehouse and datamining.
CO2. Apply pre-processing techniques for datacleansing.
CO3. Identify and design multidimensional models for data warehousing.
CO4. Analyze and Evaluate performance of algorithms for Association Rules, Classificationand Clusteringtechniques.
CO5. Develop research interest towards advances in data mining.

UNIT I

Data warehousing: Definition, multi-dimensional data model, OLAP operations, warehousing schema, Data warehousing Architecture, warehouse server, metadata OLAP engine, Data warehouse backendprocess.

UNIT II

Data Mining: Definition, KDD vs Data mining, DBMS vs Data mining, Data mining Techniques, Issues and challenges in data mining.

UNIT III

Association Rules: Introduction, Methods to discover Association, Apriori algorithm, Partition algorithm, Pincer search algorithm, FP-tree growth algorithm, Incremental algorithm, Border algorithm, Association rules with itemconstraints.

UNIT IV

Clustering Techniques: Introduction, clustering paradigms, partitioning algorithm, K-medoid algorithms, CLARA, CLARANS, Hierarchical clustering, DBSCAN, BIRCH, CURE.

UNIT V

Decision trees: Introduction, tree construction principles, Decision tree construction algorithms, CART, ID3, C4.5, CHAID, Decision tree construction with pre-sorting.
Introduction to web mining, web content mining, web structure mining, web usage mining, Text mining.

Text Books

1. Jiawei Han, Micheline Kamber, Jian Pei, “Data Mining: Concepts and Techniques”, Morgan. Kaufmann publishers, 2011.

Reference Books

1. Arun K Pujari, “Data Mining Techniques”, University press, 2016

Web References

1. https://nptel.ac.in/courses/106/105/106105174/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	-	-	-	-	-	-	L	-	H	-	-
CO2	-	-	-	-	M	M	-	H	-	-	-	-	M	H	-
CO3	-	-	H	-	H	-	-	-	-	H	-	-	H	-	-
CO4	-	H	-	-	-	-	-	-	-	-	-	-	M	H	M
CO5	-	-	H	-	-	-	-	-	-	-	-	-	L	-	H

19CST23: DEEP LEARNING

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Major deep learning algorithms, the problem settings, and their applications to solve real world problems.
2. Deep learning methods for working with sequentialdata.
3. Deep recurrent and memorynetworks.
4. Deep Turingmachines.
5. Apply such deep learning mechanisms to various learningproblems.
6. Open issues in deep learning, and have a grasp of the current researchdirections.

Course Outcomes

After successful completion of course the students should be able to

CO1. Understand the theory behind deep learning methods such as Convolutional Neural Networks, Auto encoders and Boltzmann Machines.
CO2. Acquire knowledge on the open issues and trends in deep learning research.
CO3. Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains
CO4. Devise deep learning algorithms and solve real-world problems

UNIT I

Introduction: Feedforward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, aka the vanishing gradient problem, and ways to mitigate it, RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout.

UNIT II

Convolutional Neural Networks: Architectures, The Convolution operation, Motivation, convolution / pooling layers, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Tiled Convolution, Efficient Convolution algorithms, The Neuroscientific Basis for Convolutional Networks.

UNIT III

Recurrent Neural Networks: Recurrent Neural Networks - Teacher Forcing and Networks with Output Recurrence , Computing the Gradient in a Recurrent Neural Network, Modeling Sequences Conditioned on Context with RNNs, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent networks, Recursive Neural Networks, Echo state Networks, LSTM, Other Gated RNNs.

UNIT IV

Deep Unsupervised Learning: Autoencoders (standard, sparse, denoising, contractive, etc), Variational Autoencoders, Adversarial Generative Networks, Autoencoder and DBM.

UNIT V

Applications of Deep Learning to NLP: Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Glove, Evaluations and Applications in word similarity, analogy reasoning, Named Entity Recognition, Opinion Mining using Recurrent Neural Networks, Parsing and Sentiment Analysis using Recursive Neural Networks.

Text Books

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville, "Deep learning", An MIT Press book, 2018.
2. Rajiv chopra, "Deep Learning- A practical Approach",Khannapublishing,2018.

Reference Books

1. Bengio, Yoshua, "Learning deep architectures for AI (Foundations and trends in Machine Learning)", Now Publishers Inc., 2009.

Web References

1.https://nptel.ac.in/courses/106/105/106105215/
2.https://nptel.ac.in/courses/106/106/106106184/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	L	-	-	L	L	M	-	-	H	-	M
CO2	H	-	-	L	-	-	-	-	-	M	-	-	H	-	L
CO3	-	H	-	H	-	-	-	-	-	-	-	-	M	H	-
CO4	-	-	H	H	M	L	M	L	M	-	-	-	L	H	M

ELECTIVE - III

19CST24: CLOUD COMPUTING

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Fundamental concepts in the area of cloudcomputing.
2. Applications of cloudcomputing.
3. Cloud architecture andmodel.
4. Analyse the concept of virtualization and design of cloudservices.
5. Illustrate the familiarity of the lead players in thecloud.
6. Evaluate the features of Cloud Simulator.

Course Outcomes

After successful completion of course the student should be able to

CO1. Define cloud computing and related concepts.
CO2. Know the key dimensions of the challenges and benefits of Cloud Computing.
CO3. Comprehend the hardware necessary for cloud computing and how components fit together.
CO4. Determine the suitability of in-house v/s hosted solutions.
CO5. Understand the systems, protocols and mechanisms to support cloud computing and develop applications for cloud computing.
CO6. Identify numerous opportunities exist for practitioners seeking to create solutions for cloud computing.

UNIT I

Systems Modelling, Clustering and Virtualization: Distributed System Models and Enabling Technologies. Computer Clusters for Scalable Parallel Computing. Virtual Machines and Virtualization of Clusters and Data centres.

UNIT II

Foundations: Introduction to Cloud Computing, Migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era. The Enterprise Cloud Computing Paradigm

UNIT III

Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS / SAAS): Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service. Secure Distributed Data Storage in Cloud Computing. Aneka, Comet Cloud, T-Systems, Understanding Scientific Applications for CloudEnvironments

UNIT IV

Monitoring, Management and Applications: Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Production for HPC on Clouds, Best Practices in Architecture Cloud Applications in the AWS cloud, Building Content Delivery networks Clouds

UNIT V

Governance and Case Studies: Organisational Readiness and Change management in the Cloud age. Data Security in the Cloud, Legal issues in Cloud computing. Achieving Production Readiness for Cloud Services

Text Books

1. Rajkumar Bi, Cloud Computing, "Principles and Paradigms", John Wiley & Sons Inc.,2011.
2. Kal Hwang, Geoffeiy C. Fox, Jack J.Dongarra, "Distributed and Cloud Computing", Elsevier,2012

Reference Books

1. Anthony T.Velte, Toby J.VeFte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw Hill,2011.
2. Gautam Shroif, "Enterprise Cloud Computing", Cambridge University Press,2010.

Web References

1. https://nptel.ac.in/courses/106/105/106105167/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	-	-	-	-	-	M	-	-	H	-	-
CO2	H	-	-	-	-	-	-	-	-	M	-	-	H	-	-
CO3	H	-	-	-	M	-	-	-	-	-	-	-	M	H	-
CO4	L	H	-	-	-	-	-	-	-	M	-	-	H	-	L
CO5	H	-	-	-	M	-	-	-	-	-	-	-	H	-	M
CO6	-	-	H	H	M	-	-	-	-	-	-	-	M	-	H

19CST25: DISTRIBUTED COMPUTING

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. The collaborative operations of collections of computersystems.
2. How to develop industry recommended projects as well group as researchoriented.

Course Outcomes

After successful completion of course the students should be able to

CO1. Gain advanced knowledge in, IPC mechanisms and Event Synchronization, Distributed Computing Paradigms, SOCKET API, Group Communication, Distributed Objects, Remote Method Invocation (RMI) and Internet Applications.

CO2. Analyse message passing, client- server and peer -to-peer models to understand distributed computing paradigms.

CO3. Design and Implement application programs on distributed computing systems.

CO4. Apply appropriate techniques and tools to design distributed computing systems and deploying in Internet applications.

UNIT I

Introduction: Forms of computing-Strengths and weaknesses of distributed computing-OS overview-Network Overview-Software Engineering overview.

UNIT II

Inter Process Communication IPC: Program Interface-Event Synchronization, Timeouts and threading, Deadlock and timeouts, Data representation, Data encoding, Text based protocols, Request response protocols Event and sequence diagram, Connection vs. connectionless IPC.

UNIT III

Distributed Computing Paradigms: Message passing, client server, peer to peer, message system, remote procedure, call model, distributed objects, object space, mobile agent, network services, collaborative application - Abstraction, Trade-offs: abstraction vs overhead, scalability, cross-platform.

UNIT IV

Socket API: Socket metaphor, diagram socket API stream mode socket API, sockets with non-blocking I/O, secure socket API, Client server paradigm, Issues, service session, protocol for a service, Inter-process communications & event synchronization, data representation, Software engineering for a network service, software architecture, IPS Mechanism, Daytime client server, Connection oriented and connectionless servers, Echo client server, Iterative server and concurrent server, Stateful servers - global state information, session stateinformation.

UNIT V

Group Communication: Unicasting, Multicasting, Multicast API, Connection oriented and connectionless Reliable, Unreliable multicast, Java Basic Multicast API-IP Multicast addresses, Joining/sending multicast group.

Text Books

1. A. Taunenbaum, “Distributed Systems: Principles and Paradigms”, Pearson, 2017.

Reference Books

1. M. L. Liu, "Distributed Computing: Principles and Applications", Pearson/Addison-Wesley,2004.
2. G. Coulouris, J. Dollimore and T. Kindberg, "Distributed Systems: Concepts and Design", 2nd edition, Pearson Education,2011.
3. Hagit Attiya, Jennifer Welch, "Distributed Computing: Fundamentals, Simulations, and Advanced Topics", Second Edition, Wiley-Interscience,2004.

Web References

1.https://nptel.ac.in/courses/106/106/106106107/
2.https://nptel.ac.in/courses/106/106/106106168/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	-	-	-	-	-	-	-	-	H	-	-
CO2	-	L	-	H	-	-	-	-	-	-	-	-	H	-	-
CO3	-	L	H	L	-	-	-	-	-	-	-	-	L	H	M
CO4	-	H	M	-	H	-	-	-	-	-	-	-	L	H	M

19CST26: BIG DATA ANALYTICS

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to thefollowing:

1. Basics of Hadoop,Map-reduce.
2. Analytics – Concepts, Data preparation – merging, managing missing numbers sampling, Data visualisation, Basicstatistics
3. Handling an analytics project on BigData
4. Big data for businessintelligence.

Course Outcomes

After successful completion of course the student should be able to

CO1. Describe Big Data and its importance with its applications

CO2. Differentiate various big data technologies like Hadoop, MapReduce, Pig, Hive, HBase and No-SQL.

CO3. Apply tools and techniques to analyze Big Data.

CO4. Design a solution for a given problem using suitable Big Data Techniques

UNIT I

Introduction to Bigdata: Definition of Big data, History of Data Management, Big data characteristics: Volume, Variety, Velocity, Veracity; Analytics, Basic nomenclature, Analytics process model, Analytical model requirements, Types of data sources, Sampling, Types of data elements, Missing values, Standardizing data, Outlier detection and treatment, Categorization.

UNIT II

Hadoop and Hadoop Distributed File Systems: A brief history of Hadoop, The Hadoop ecosystem, Hadoop release, The building blocks of Hadoop, Name node-data node, secondary name node, Job tracker, Task tracker. The Hadoop Distributed File System: The design of HDFS, HDFS concepts, Hadoop file systems.

UNIT III

Data Modeling: NoSQL data modeling techniques: Types of NoSQL stores, Choice of database system, JSON, Column Family Databases, Operations on column family, Understanding Cassandra data model, Designing Cassandra data structures, Schema migration approach using ETL.

UNIT IV

Map-Reduce: MapReduce workflows, How MapReduce works, Anatomy of MapReduce: MapReduce1, MapReduce2, Failures in classic MapReduce; YARN, Failure in YARN, Job scheduling - The fair scheduler, The capacity scheduler; Shuffle and sort in MapReduce.

UNIT V

Extracting Values from Bigdata: In- memory computing technology, Real-time analytics, CAP Theorem, Use of In-memory data grid, Map-Reduce and real time processing, Real-time analysis of machine generated data.

Data Scientist: Definition, Big Data flow, Data scientist activities.

Textbooks

1. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley Publications,2014.

2. Mohanty S, Jagadeesh M, Srivatsa H, “Big data Imperatives: Enterprise big data warehouse, BI Implementation and analytics”, Apress/Springer (India), 2013.

Reference Books

1. Tom White, “Hadoop: The Definitive Guide”, Fourth Edition, O’Reilly Publications,2016.
2. DT Editorial Services, “Big Data Black Book”, Dream tech Press, 2016.

Web References

1.https://nptel.ac.in/courses/106/106/106106142/
2.https://nptel.ac.in/courses/106/104/106104189/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	M	-	-	-	-	-	-	-	-	H	-	-
CO2	-	H	M	L	-	-	-	-	-	-	-	-	H	H	H
CO3	-	-	-	M	H	-	M	L	-	-	-	-	-	H	M
CO4	-	-	H	L	M	-	-	-	-	-	-	-	M	M	H

OPEN ELECTIVE - I
(Refer to concerned Department Syllabus)

19CSP09: MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE LAB

Credits–1 **Sessional Marks:40**
L:T:P::0:0:2 **University Exam Marks:60**

Course Objectives

To expose the students to the following:

1. The basic concepts of Artificial intelligence usingPYTHON.
2. PROLOGenvironment.

Course Outcomes

After successful completion of course students should be able to

CO1. Gain wide exposure on the basic concepts in Artificial Intelligence.
CO2. Apply various Heuristic search procedures to determine optimal solutions in real time applications.
CO3. Use PROLOG for developing AI applications.
CO4. Implementation procedures for the machine learning algorithms.
CO5. Apply appropriate data sets to the Machine Learning algorithms.
CO6. Analyse Machine Learning algorithms to solve real world problems.

LIST OF EXPERIMENTS IN ARTIFICIAL INTELLIGENCE

Use python programming Language to implement the following programs:

1. Write a Program For DEPTH FIRSTSEARCH.
2. Write a Program For BEST FIRSTSEARCH.
3. Write a Program to Generate the output for A*Algorithm.
4. Write a Program to solve Water Jug Problem Using HeuristicFunction.
5. Write a Program To Show the TIC TAC TOE Game for 0 andX.
6. Write a program to implement N-Queen problem using Iterativemethod.
7. Write a program to implement Water JugProblem.
8. Write a program to implement Hill Climbing Algorithm to solve Blocks worldproblem.

Use PROLOG to implement the following programs:

9. Write a Program in PROLOG to solve water jug problem through the usage ofrules.
10. Write simple facts for statements using PROLOG.
    Example: Write simple fact forfollowing:
    a. Ram likesmango.
    b. Seema is agirl.
    c. Bill likesCindy.
    d. Rose isred.
    e. John owns gold.
11. Write a program to demonstrate Family relationships inPROLOG.
12. Write a program to implement Travelling salesman problem usingPROLOG.
13. Write a program to show Concept of List inPROLOG.
14. Write your own rules (don't use any pre-defined relations in Prolog language) for each of the followingoperations:-
    a. Adding element X in the list L at start and at end
    b. Deleting element X from the list L
    c. Checking if element X is present in listL
    d. Concatenating two lists L1 and L2 into a listL
15. Write a predicate factorial (N, X) which finds the factorial (X) of the given number(N).

LIST OF EXPERIMENTS IN MACHINE LEARNING

16. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a CSVfile.
17. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the trainingexamples.
18. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
19. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate datasets.
20. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a CSV file. Compute the accuracy of the classifier, considering few test datasets
21. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
22. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML libraryclasses/API.
23. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in theprogram.
24. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for thisproblem.
25. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and drawgraphs.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	M	M	M	L	-	M	-	-	-	-	H	L	-
CO2	-	M	H	M	H	M	-	M	-	-	L	-	M	H	L
CO3	L	L	H	M	L	-	M	M	-	-	-	-	M	H	L
CO4	-	L	H	M	M	-	-	M	-	-	-	L	M	H	L
CO5	H	L	M	M	L	-	-	M	-	-	L	-	M	H	L
CO6	L	H	M	L	M	-	-	M	-	-	-	-	M	H	L

19CSP10: COMPUTER NETWORKS LAB

Credits–1 **Sessional Mark:40**
L:T:P::0:0:2 **University Exam Marks:60**

Course Objectives
To expose the students to the following:
1. The concepts of all the layers to implement framingmethods.
2. The required skills for developingalgorithms.

Course Outcomes
After successful completion of course the students should able to
CO1. Develop the programs related to Bit stuffing, character count.
CO2. Apply appropriate algorithm for the finding of shortest route.
CO3. Simulate the encryption and decryption concepts in network layer
CO4. Demonstrate communication between the peers using client-server programming.

LIST OF PROGRAMS

1. Implement the data link layer framing methods such as bitstuffing
2. Implement the data link layer framing methods such as characterstuffing.
3. Implement RSAAlgorithm.
4. Implement on a data set of characters the threeCRC.
5. Implement Dijkstra's algorithm to compute the shortestpath.
6. Take an example subnet of hosts. Obtain broadcast tree forit.
7. Write a program to break the above DEScoding.
8. Write a program to create asocket.
9. Write a program for Data link layer framing method (Charactercount).
10. Write a program for Sliding windowprotocol.
11. C Program To Implement UDP Client Server Communication Using Bind SystemCall
12. Java Client Server Program Using ByteStream
13. Java MulticastingProgram
14. C Program To Restart Server By Capturing SIGHUPsignal
15. Java Program for Message GroupWindow
16. Java Window ChatProgram

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	H	-	H	-	M	L	-	-	-	-	M	H	L
CO2	-	H	H	L	M	L	-	L	-	-	-	-	M	H	L
CO3	-	-	-	-	H	H	-	L	-	-	-	-	M	H	L
CO4	-	-	-	-	H	-	-	L	-	H	M	-	M	H	L

B.Tech
IV Year I Semester

B.Tech IV Year I Semester

S.No	Course Code	Course Title
1	19CST16	Cryptography and Network Security
2	19CST17	Internet and Web Programming
3	19CSM01	Elective – IV (Mandatory MOOCs)
4		Open Elective – II
19CST36		Basics of Computer Networks
19CST37		Introduction to programming withPython
19CST38		Introduction to Database Management Systems
19CST39		Introduction to Cloud Computing
5	19CSP11	Cryptography and Network Security Lab
6	19CSP12	Internet and Web Programming Lab
7	19CSI01	Internship
8	19CSS01	Technical Seminar
9	19CSJ01	Project Work Phase – I

19CST16: CRYPTOGRAPHY AND NETWORK SECURITY

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. The basic categories of threats to computers, networks and various cryptographicalgorithms.
2. Public-keycryptosystem.
3. Various key distribution and managementschemes
4. Fundamental ideas of public-keycryptography.
5. Distribution of PGP key pair and use the PGP package to send an encrypted e-mailmessage.

Course Outcomes

After successful completion of course the students should be able to

CO1. Identify the security issues in the network and resolve it.

CO2. Analyse the vulnerabilities in any computing system and hence be able to design a security solution.

CO3. Evaluate security mechanisms using rigorous approaches by key ciphers and Hash functions.

CO4. Demonstrate various network security applications, IPSec, Firewall, IDS, Web Security, Email Security and Malicious software etc.

UNIT I

Attacks on Computers and Computer Security: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT II

Symmetric key Ciphers: Block Cipher principles & Algorithms (DES, AES, Blowfish), Block cipher modes of operation, Stream ciphers, RC4, Key distribution

UNIT III

Asymmetric key Ciphers: Principles of public key cryptosystems, Algorithms (RSA, Diffie-Hellman, ECC), Key Distribution

UNIT IV

Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, HMAC, CMAC, Digital signatures.

UNIT V

E-Mail Security: Pretty Good Privacy, S/MIME

IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, key management.

Text Books

1. William Stallings, “Cryptography and Network Security: Principles and Practice”, 7th Edition, Pearson Education, 2017.

Reference Books

1. C K Shyamala, N Harini, Dr T R Padmanabhan, "Cryptography and Network Security", 1st Edition, Wiley India,2011.
2. Forouzan Mukhopadhyay, "Cryptography and Network Security", 2nd Edition, McGraw Hill,2011.
3. Mark Stamp, "Information Security, Principles and Practice", 2nd Edition, Wiley India,2011.

Web References

1.https://nptel.ac.in/courses/106/105/106105162/
2.https://nptel.ac.in/courses/106/105/106105031/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	L	M	H	-	-	-	-	L	-	-	-	H	-	-
CO2	L	M	H	H	-	-	-	L	-	-	-	-	H	L	M
CO3	-	H	-	-	-	L	-	L	-	-	-	-	H	-	-
CO4	H	-	-	-	-	-	L	-	-	L	-	-	H	-	M

19CST17: INTERNET AND WEB PROGRAMMING

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. The concept like tags, script, and code that create webpages.
2. How the web and web pages work.
3. Build the skills and to understand the potentials of developing a webapplication.
4. Develop web applications with Perl and PythonProgramming.

Course Outcomes

After Successful completion of course the students should be able to

CO1. Apply a structured approach to identifying needs, interests, and functionality of a website.
CO2. Design dynamic websites that meet specified needs and interests.
CO3. Use JavaScript to add dynamic content to pages.
CO4. Critique JavaScript code written by others, identifying examples of both good and bad practice.
CO5. Modify existing HTML, CSS, and JavaScript code to extend and alter its functionality, and to correct errors and cases of poor practice.
CO6. Develop web-based applications using Perl and Python programming.

UNIT I

HTML Common tags: List, Tables, images, forms, Frames; Cascading Style sheets.

UNIT II

JAVA Script: Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script. XML: Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX.

UNIT III

Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizes, Java Beans API, Introduction to EJB's.

UNIT IV

Introduction to Perl and Scripting: Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT V

Python: Introduction to Python language, python syntax, statements, functions, Built-in-functions and Methods, Modules in python, Exception Handling. Integrated Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework

Text Books

1. Robert W.Sebesta, "Programming the World Wide Web", Seventh edition, Pearson,2014.
2. David Barron, "The World of Scripting Languages", First edition, Wiley Publications,2000.

Reference Books

1. Mark lutz, “Programming Python”, Fourth Edition, O'Reilly Media, 2011.
2. Ellie Quigley, “Perl by Example”, Fifth Edition, O'Reilly Media, 2014.

Web References

1.https://www.youtube.com/watch?v=9k48hjSSOPA

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	M	-	M	-	-	-	-	-	-	-	-	H	-	-
CO2	-	-	H	M	-	-	-	-	-	-	-	-	M	H	-
CO3	-	-	M	-	H	-	-	-	-	-	-	-	M	H	-
CO4	-	H	-	-	-	-	-	-	-	-	-	-	H	-	-
CO5	-	H	-	M	-	-	-	-	-	-	-	-	M	H	-
CO6	-	-	H	-	-	-	-	-	-	-	-	-	M	H	-

ELECTIVE - IV

Mandatory MOOCS

OPEN ELECTIVE - II
(Refer to Concerned Department Syllabus)

19CSP11: CRYPTOGRAPHY AND NETWORK SECURITY LAB

Credits–1 **Sessional Marks:40**
L:T:P::0:0:2 **University Exam Marks:60**

Course Objectives
To expose the students to thefollowing:
1. Various substitutiontechniques.
2. Simulate public keycryptosystem.

Course Outcomes
After successful completion of the lab, students can able to
CO1. Implementation of Shift and Ceaser cipher.
CO2. Develop a java interface for encryption and decryption algorithms i.e., AES, MD5 and RSA algorithms.
CO3. Analyse the real time problems using cryptography techniques.
CO4. Design an Elgamal Public Key Crypto System for network security.

LIST OF PROGRAMS

1. Write a program in Java to implement Arithmetic operations on LargeIntegers.
2. Write a program in Java to implement Prime NumberGeneration
3. Write a program in Java to implement EuclideanAlgorithm
4. Write a program in Java to implement ShiftCipher
5. Write a program in Java to implement CeaserCipher
6. Write a program in Java to implement SubstitutionCipher(monoalphabetic)
7. Write a program in Java to implement Data EncryptionStandard
8. Write a program in Java to implement Cipher Block Chaining inAES
9. Write a program in Java to implement Output Feedback inAES
10. Write a program in Java to implement Rivest Shamir Adleman(RSAalgorithm)
11. Write a program in Java to implement Elgamal Public KeyCryptoSystem
12. Write a program in Java to implement MessageDigest(MD5)

Note: Cryptography and Network Security Lab *S*oftware used "NETBEANS" and programming language is "JAVA"

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	M	-	H	-	-	-	-	-	-	-	M	H	L
CO2	-	L	H	-	-	-	-	L	-	-	-	-	M	H	L
CO3	-	H	-	M	-	-	-	L	-	-	-	-	M	H	L
CO4	L	M	H	-	-	-	-	-	-	-	-	-	M	H	L

19CSP12: INTERNET AND WEB PROGRAMMING LAB

Credits–1 **Sessional Marks:40**
L:T:P::0:0:2 **University Exam Marks:60**

Course Objectives

To expose the students to the following:

1 The principles of creating an effective webpage.
2 The language of the web: HTML andCSS.
3 Develop skills in analyzing the usability of a website.
4 How to use JavaScript to access and use web services for dynamiccontent.

Course Outcomes

After successful completion of course the students should be able

CO1. Use Javascript and XHTML to create web pages with advanced interactivity.
CO2. Program basic functions in Javascript and XHTML.
CO3. Use javascript to create functional forms.
CO4. Us Javascript to control browser frames and windows.
CO5. Use cascading style sheets to design web pages.

LIST OF PROGRAMS

1. Develop and demonstrate a XHTML file that includes Javascript for the following problems:
   a) Input: A number n obtained usingprompt Output: The first n Fibonaccinumbers
   b) Input: A number n obtainedusingprompt
   Output: A table of numbers from 1 to n and their squares using alert
2. a) Develop and demonstrate, using Java script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing sothat the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to becomecompletelyvisible.
   b) Modify the above document so that when a paragraph is moved from the top stacking position, it returns to its original position rather than to the bottom.
3. a) Design an XML document to store information about a student in an engineering college affiliated to SPMVV. The information must include 100 USN, Name, Name of the College, Branch, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheetand use it to displaythedocument.
   b) Create an XSLT style sheet for one student element of the above document and use it to create a display of that element.
4. a) Write a Perl program to display various Server Information like ServerName, Server Software, Server protocol, CGI Revision etc
   b) Write a Perl program to accept UNIX command from a HTML form and to display the output of the command executed.
5. a) Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greetingmessages.
   b) Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with properheadings.
6. Write a Perl program to display a digital clock which displays the current time oftheserver.
7. Write a Perl program to insert name and age information entered by the user into atable created using MySQL and to display the current contents ofthistable.

8. Create a XHTML form with Name, Address Line 1, Address Line 2, and E-mail text fields. On submitting, store the values in MySQL table. Retrieve and display the data based onName.
9. Write a Python program to perform Selectionsort.
10. Write a Python program to perform Insertionsort
11. Write a Python program to perform Mergesort

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	H	-	-	-	-	-	-	-	M	H	L
CO2	-	M	H	-	-	-	-	-	-	-	-	-	M	H	L
CO3	-	-	-	-	H	-	-	-	-	-	-	-	M	H	L
CO4	-	-	-	-	H	-	-	-	-	-	-	-	M	H	L
CO5	-	-	M	-	H	-	-	-	-	-	-	-	M	H	L

19CSI01: INTERNSHIP

Credits–2 **Sessional Marks:100**

Course Objectives

To expose the students to the following:

1. Expose technical students to the industrial environment, which cannot be simulated in the classroom and creating competent professionals for theindustry.
2. Provide possible opportunities to learn understand and sharpen the real time technical/managerial skills required at thejob.
3. Exposure to the current technological developments relevant to the subject area oftraining.
4. Experience gained from the "industrial internship" in classroom will be used in classroom discussions.
5. Create conditions conductive to quest for knowledge and its applicability on thejob.

Course Outcomes

After successful completion of course the student should be able to

CO1. Be hired by industry/organization.
CO2. Obtain practical experience in organization setting
CO3. Witness how the theoretical aspects learned in classes are integrated into practical world.
CO4. Decide if the industry and the profession is the best career option to pursue
CO5. Acquire new skills and supplement knowledge.
CO6. Practice communication and team workskills.
CO7. Learn strategies like time management, multi-tasking in an industrialsetup.
CO8. Enhance their candidacy for highereducation.
CO9. Create network and social circle and developing relationships with industry people.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	L	H	L	M	L	H	-	-
CO2	-	-	-	-	-	-	-	-	M	H	-	L	-	H	-
CO3	-	-	H	-	M	-	-	-	L	L	-	L	H	-	-
CO4	-	-	-	-	-	-	-	-	L	M	-	L	H	-	-
CO5	-	-	-	-	M	-	-	-	-	L	-	L	H	M	L
CO6	-	-	-	-	-	-	-	M	H	H	M	L	H	L	M
CO7	-	-	-	-	H	-	-	-	M	M	-	L	H	L	M
CO8	-	-	-	-	-	-	-	M	-	-	-	H	M	H	M
CO9	-	-	-	-	-	-	-	M	M	H	-	L	H	L	M

19CSS01: TECHNICAL SEMINAR

Credits – 1
L:T:P::0:0:2 **Sessional Marks:100**

Course Objectives

To expose the students to the following:

1. Identify, understand and discuss current, real-worldissues.
2. Improve oral and written communicationskills.
3. Explore an appreciation of the self in relation to its larger diverse social and academiccontexts.
4. Apply principles of ethics and respect in interaction withothers.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire in-depth knowledge in the chosen seminar topic.
CO2. Analyse critically the chosen seminar topic for arriving at conclusions.
CO3. Understand the impact of seminar output in the context of environmental sustainability.
CO4. Improve communication skills
CO5. Prepare and present a seminar report
CO6. Develop skills for continuous learning to improve knowledge and competence in the chosen field of seminar.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO–PO–PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	M	-	-	-	L	L	M	-	-	H	L	M
CO2	-	H	-	M	-	-	-	L	M	-	-	-	H	L	M
CO3	H	-	-	-	-	-	H	L	-	-	-	-	H	L	M
CO4	L	-	-	-	-	-	-	L	M	H	-	-	H	L	M
CO5	-	M	-	-	H	-	-	L	-	-	L	-	H	L	M
CO6	L	-	-	-	-	-	-	L	-	-	-	H	H	L	M

19CSJ01: PROJECT WORK PHASE – I

Credits–3 **Sessional Marks:40**
L:T:P::0:0:6 **University Exam Marks:60**

Course Objectives

To expose the students to the following:

1. A glimpse into real world problems and challenges that need IT basedsolutions.
2. Creation of very precise specifications of the IT solution to bedesigned.
3. The vast literature available of the various research challenges in the field ofIT.
4. Awareness among the students of the characteristics of several domain areas where IT canbe effectivelyused.
5. How to use all concepts of IT in creating a solution for aproblem.
6. The team building, communication and management skills of thestudents.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire in-depth knowledge in the core and/or interdisciplinary area of project topic.
CO2. Critically analyze the chosen topic for arriving at conclusions.
CO3. Develop and design feasible solutions for the project topic.
CO4. Undertake research and solve real world problems in the project domain.
CO5. Apply appropriate techniques, resources and modern software tools necessary for implementing the project work.
CO6. Use project results for sustainable development of the society.
CO7. Understand the impact of project results in the context of environmental sustainability.
CO8. Understand professional and ethical responsibilities for sustainable development of society in the chosen field of project.
CO9. Function effectively as individual and a member in the project team.
CO10. Develop communication skills, both oral and written for preparing and presenting project report.
CO11. Demonstrate knowledge and understanding of cost and time analysis required for carrying out the project.
CO12. Engage in continuous learning to improve knowledge and competence in the chosen subject area of project.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	L	-	-	-	-	-	-	M	-	-	-	M	H	L
CO2	-	H	-	M	-	-	-	-	M	L	L	-	H	M	L
CO3	-	M	H	-	-	-	-	-	M	L	L	H	H	M	L
CO4	-	L	-	M	-	-	-	-	M	L	L	L	H	M	M
CO5	L	L	-	-	H	-	-	-	M	-	L	-	L	H	M
CO6	-	-	-	-	-	H	H	-	M	-	L	-	H	M	L
CO7	M	M	-	-	L	-	H	-	M	L	L	-	H	M	L
CO8	M	-	-	-	-	M	M	H	M	L	L	-	H	M	L
CO9	-	-	-	-	-	-	-	-	H	M	L	-	H	M	L
CO10	-	L	-	L	-	-	-	-	-	H	L	-	H	M	L
CO11	H	M	-	-	-	-	-	-	M	M	M	-	H	M	L
CO12	-	-	-	-	-	-	-	-	-	-	L	H	H	L	M

B.Tech
IV Year II Semester

B.Tech IV Year II Semester

S.No	Course Code	Course Title
1		**Elective – V**
19CST27		Wireless Networks
19CST28		Information Security
19CST29		Data Science
2		**Elective – VI**
19CST30		Cyber Physical Systems
19CST31		Fault Tolerant Computing
19CST32		Speech and Natural Language Processing
3		**Open Elective – III**
19CST40		Introduction to Cyber Security
19CST41		Introduction to Artificial Intelligence
19CST42		Introduction to Java Programming
19CST43		Fundamentals of Internet of Things
4	19CSJ02	Project Work Phase – II

ELECTIVE - V

19CST27: WIRELESS NETWORKS

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. The concepts of Wireless networks, protocol stack andstandards.
2. Introduction to fundamentals of 3G Services, its protocols andapplications.
3. Evolution of 4G Networks, its architecture andapplications.

Course Outcomes

After successful completion of course students should be able to

CO1. Demonstrate Conversant with the latest 3G/4G and WiMAX networks and its architecture.
CO2. Design wireless network environment for any application using latest wireless protocols and standards.
CO3. Implement different type of applications for smart phones and mobile devices with latest network strategies.
CO4. Understanding of Mobile TCP, LTE network, Mobile Transport layer in wireless networks.

UNIT I

Wireless LAN: Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum - IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security – IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation forWIMAX

UNIT II

Mobile Network Layer: Introduction – Mobile IP: IP packet delivery, Agent discovery, tunnelling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol – mobile ad-hoc network: Routing, Destination Sequence distance vector, Dynamic sourcerouting

UNIT III

Mobile Transport Layer: TCP enhancements for wireless protocols – Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility – Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP – TCP over 3G wireless networks.

UNIT IV

Wireless Wide Area Network: Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.

UNIT V

4G Networks: Introduction – 4G vision – 4G features and challenges – Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

Text Books

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education2012.
2. Vijay Garg, “Wireless Communications and networking”, First Edition, Elsevier2007.

Reference Books

1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, “3G Evolution HSPA and LTE for

Mobile Broadband", Second Edition, Academic Press,2008.
2. Anurag Kumar, D.Manjunath, Joy kuri, "Wireless Networking", First Edition, Elsevier2011.
3. Simon Haykin, Michael Moher, David Koilpillai, "Modern Wireless Communications", First Edition, Pearson Education2013.

Web References

1.https://www.youtube.com/watch?v=pnunzdvezto

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	-	-	-	-	-	M	-	-	L	-	-	H	-	-
CO2	L	M	H	L	L	-	-	-	-	L	-	-	M	H	M
CO3	L	M	H	L	L	-	-	-	-	L	-	-	M	H	M
CO4	H	L	-	-	-	-	-	-	-	-	-	-	H	-	-

19CST28: INFORMATION SECURITY

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. The basic approaches in information security, the information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
2. The prevalent network and distributed system attacks defences against them andforensics.
3. The cryptography, how it has evolved and some key encryption techniques usedtoday.
4. Security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of messageexchanges.

Course Outcomes

After successful completion of course the students should be able to

CO1. Formulate information security governance, and related legal and regulatory issues.
CO2. Devices how threats to an organization are discovered, analyzed, and dealt with.
CO3. Evaluate network security, threats and countermeasures.
CO4. Construct network security designs using available secure solutions (such as PGP, SSL, IPSec, etc)
CO5. Acquire the knowledge of advanced security issues and technologies (such as DDoS attack detection and containment, and anonymous communications).

UNITI

Fundamentals: Introduction to Information Security, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, SDLC, SecuritySDLC.

UNITII

Security Investigation: Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues.

UNIT III

Security Analysis: Risk Management: Identifying and Assessing Risk - Assessing and Controlling Risk - Trends in Information Risk Management - Managing Risk in an Intranet Environment.

UNIT IV

Logical Design: Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

UNIT V

Physical Design: Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel issues.

Text Books

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, 6th Edition, Cengage Learning Publishers, 2017.

Reference Books

1. Stuart McClure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGrawHill,2012.
2. Matt Bishop, “Computer Security Art and Science”, Pearson/PHI,2015.
3. Micki Krause, Harold F. Tipton, “Handbook of Information Security Management”, Vol 1-3, Press LLC, 2007.

Web References

1.https://nptel.ac.in/courses/106/106/106106129/
2.https://nptel.ac.in/courses/106/106/106106141/
3.https://nptel.ac.in/courses/106/106/106106157/
4.https://nptel.ac.in/courses/106/106/106106178/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	L	H	-	M	-	-	-	-	-	-	-	H	-	-
CO2	-	H	M	-	L	-	-	-	-	-	-	-	H	-	-
CO3	-	-	M	H	-	-	-	-	-	-	-	-	H	-	M
CO4	-	-	H	M	L	-	-	-	-	-	-	-	H	M	M
CO5	-	-	M	-	L	-	-	-	-	-	H	-	H	-	-

19CST29: DATA SCIENCE

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. How to analyse the data and apply operations on it with textmining.
2. Measuring the statistics of the data using Az-score, p-score, One-tail test, F distribution, Chi-square distribution,ANOVA.
3. Basic knowledge on estimating the likelihood ofevents.

Course Outcomes

After successful Completion of course the students should be able to

CO1. Present a report on how data is collected, managed and stored for data Science.

CO2. Demonstrate scholarly knowledge while uncovering the concept of machine learning for analysis.

CO3.Perform experiments on the estimation of the likelihood of events for generating recommendation and sentiment analysis for twitter real- timedata.

CO4. Determine how data science can be applied in real time application.

UNIT I

Getting Started with Raw Data: The world of arrays with NumPy, Empowering data analysis with pandas, Data cleansing, Data Operations. Inferential Statistics: Various forms of distribution, Az-score, p-score, One-tail test, F distribution, Chi-square distribution, ANOVA.

UNIT II

Finding a Needle in a haystack: What is data mining, presenting the analysis, studying the Titanic. Making Sense of Data through Advanced Visualization: Charts, plots, Heat maps, histograms, scatter plot matrix, Area plots.

UNIT III

Uncovering Machine Learning: Decision tress, linear regression, Logistic regression, Naïve Bayes Classifier, k-means clustering. Performing predictions with Linear Regression: Simple Linear regression, multiple regressions, training and testing a model.

UNIT IV

Estimation the likelihood of events: Logistic regression, Generating recommendation with collaborative filtering: Used-based, Item-based.

UNIT V

Analyzing unstructured data with text mining: Pre-processing data, creating a world cloud, word and sentence tokenization, parts of speech tagging, stemming and lemmatization, performing sentiment analysis on world leaders using Twitter.

Text Books

1. Samir Madhavan, “Mastering Python for Data Science”, PACKT Publishing, 2015.

Reference Books

1. Cathy O’Neil and Rachel Schutt, “Doing Data Science, Straight Talk From The Frontline”, O’Reilly,2014.
2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman, “Mining of Massive Datasets”, Cambridge University Press,2010.

Web References

1.https://nptel.ac.in/courses/106/106/106106179/
2.https://nptel.ac.in/courses/106/106/106106212/
3.https://nptel.ac.in/courses/106/105/106105186/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	H	-	-	-	-	-	-	-	H	-	-	H	L	-
CO2	H	-	-	-	-	-	-	-	-	M	-	-	H	-	-
CO3		L	H	M	M	-	-	M	-	-	-	-	M	H	M
CO4	-	L	-	H	-	-	-	-	-	M	-	M	H	-	M

ELECTIVE - VI

19CST30: CYBER PHYSICAL SYSTEMS

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Various CPS Architectures, network control and challenges in CPSdesign.
2. Interconnection issues, limitations and research challenges in cyber physical internet,QoS.
3. Security, networking and communication issues.
4. Issues in mobile computing and services ofnetwork.
5. Various control systems and itsmanagement.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand basic concepts of Cyber physical systems architecture and design challenges.
CO2. Interpret Cyber physical internet and transport protocol services.
CO3. Express proficiency in Cyber physical system security and heterogeneous networkingissues.
CO4. Solve various real time problems in mobile computingissues.
CO5. Learn several tools and techniques in Cyber physicalsystems.

UNIT I

Cyber Physical Systems (CPSs): Introduction, Background, Introduction to wireless CPS's, Research trends, CPS in the real world

CPS Architecture: Prototype architecture, Open data service architecture, design for CPS, Multilayer wireless networking, Heterogeneous CPS network architecture, Architecture for heterogeneous mobile computing, Barwan.

Cyber Physical system: Introduction, Network control for cyber physical systems, Network latency in cyber physical system, Design challenges in cyber physicalsystem.

UNIT II

Interconnection Issues in CPS: Introduction, multicast problems in adhoc networks, Introduction to coverage in wireless sensors, issues in IEEE 802.11

Cyber Physical Internet: Introduction, fundamental limitations and important research challenges, protocol stack Architecture, cps interconnection protocol, transport protocol services.

NETWORK QOS IN CPS: Introduction, possibilities and challenges in internet QOS

UNIT III

CPS Security: Introduction, Security, Challenges

Security Issues of CPS: Introduction, Securing cps, Attacks and its consequences, Security problems in control systems, Control systems against malicious attacks.

Interoperability and Communication Issues in CPS: Heterogeneity, Synchronization methods, Network

Heterogeneous Networking Issues: Introduction, An architectural framework for heterogeneous networking network, Model survivable overlay networks and services, Network reconstitution through heterogeneous replication service model.

UNIT IV

Heterogeneous Mobile Computing Issues: Introduction, Overlay networking, Reliable data transmission. Scalable Architecture for Heterogeneous Environment, Cluster-Based Proxies, Generalized Proxies.

Network Services: Introduction, Service discovery, Remote-control Interface, Security issues

UNIT V

Cyber Physical Control Systems: Introduction, Adaptive and predictive methods, control system architectures, RCS methodology Objectives.

Cyber Physical Systems Management Introduction, Background, Reliability, Tools and Techniques

Text Books

1. P. Venkata Krishna, V. Saritha and H. P. Sultana, "Challenges, Opportunities, and Dimensions of Cyber Physical Systems", IGI Global, 2014.

Reference Books

1. Danda B. Rawat, Joel J.P.C.Rodrigues, Ivan Stojmenovic, "Cyber-Physical Systems: From Theory to Practice", CRC press,2015.
2. DeitmarP.F.Mollar, "Guide to computing fundamentals in cyber-physical systems", Springer,2016.

Web References

1.https://www.coursera.org/learn/cyber-physical-systems-1

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	L	-	-	L	-	M	-	-	H	-	-
CO2	-	L	-	H	-	-	-	-	-	-	-	-	H	-	L
CO3	H	-	-	-	-	-	-	-	-	-	-	-	H	-	M
CO4	L	-	H	M	-	-	-	-	-	-	-	-	H	-	M
CO5	H	-	-	-	L	-	-	L	-	-	-	-	L	H	-

19CST31: FAULT TOLERANT COMPUTING

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. The basic concepts of fault-tolerant computingsystem.
2. The reliability and availability of the computingsystems.
3. The fault tolerant in real time networking systems.
4. The interconnections of networks andarchitectures.

Course Outcomes

After successful completion of course the student should be able to

CO1. Perform probabilistic dependability analysis of fault-tolerant computer system using fault-trees, reliability block diagrams.

CO2. Describe the principles and properties of techniques used for error detection, error recovery and error masking in computer systems.

CO3. Design system architectures for fault-tolerant computer systems from a given requirements specification.

CO4. Formulate requirements for fault-tolerant computer systems used in business, safety and mission critical applications.

UNIT I

Introduction: Computer and Computation Distribution, System models and Fault models. Test generation for combinational circuits, sequential circuits and Fault simulation.

UNIT II

Fault Tolerance Concepts: Recovery in time, Fault detection techniques, Modeling Fault tolerant systems, Rollback modular redundancy and Exception Handling.

UNIT III

Fault Tolerant in Real time Systems: Architecture of Fault, Tolerant computers general purpose commercial systems, high availability systems, Critical computations Fault Tolerant multiprocessor, Communication Architectures, Shared memory.

UNIT IV

Interconnections: Loop architectures, Tree Networks, Graph Network and in Binary cube interconnection.

UNIT V

Fault Tolerant Software: Design of fault Tolerant software, Reliability Models, Construction of acceptance tests, validation of Fault tolerant software.

Text Books

1. Israel & Krishnan, “Fault Tolerant Systems”, Elsevier Publications, 2013.

Reference Books

1. Elena Dubrova, “Fault-Tolerant Design”, Springer,2013.
2. PrashantMhaskar, Jinfeng Liu, Panagiotis D. Christofides, “Fault-Tolerant Process Control - Methods and Applications”, Springer,2013.

Web References

1.http://www2.cs.uidaho.edu/~krings/CS449/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	H	M	-	M	-	-	-	-	-	-	-	H	-	-
CO2	H	M	-	-	-	-	-	-	-	-	-	-	H	L	-
CO3	-	-	H	-	-	-	-	-	-	-	L	-	H	-	M
CO4	-	-	-	M	-	H	-	-	L	-	-	L	H	-	M

19CST32: SPEECH AND NATURAL LANGUAGE PROCESSING

Credits–3 **Sessional Marks:30**
L:T:P::2:1:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. The basic algorithms available for the processing of linguisticinformation.
2. The underlying computational properties of naturallanguages.
3. How to analyze linguistic and algorithmicperspectives.
4. The knowledge on the computational properties of natural languages and of the algorithms used to processthem.

Course Outcomes

After successful completion of course the students should be able to

CO1. Acquire knowledge in natural language processing and learn how to apply basic algorithms in this field.
CO2. Evaluate the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics.
CO3. Explore the resources of natural language data - corpora.
CO4. Demonstrate the basics of knowledge representation, inference, and relations to the artificial intelligence.

UNIT I

Introduction, Regular Expressions, Text Normalization and Edit Distance: Regular Expressions, 2.3 Corpora Text Normalization Minimum Edit Distance

N-gram Language Models: N-Grams, Evaluating Language Models, Generalization and Zeros, Smoothing, Kneser-Ney Smoothing, The Web and Stupid Backoff, Advanced: Perplexity's Relation to Entropy

UNIT II

Logistic Regression: Classification: the sigmoid, Learning in Logistic Regression, the cross-entropy loss function Gradient Descent, Regularization, Multinomial logistic regression, interpreting models, Advanced: Deriving the Gradient Equation.

Vector Semantics: Lexical Semantics, Vector Semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF: Weighing terms in the vector, Applications of the tf-idf vector model, Optional: Pointwise Mutual Information (PMI), Word2vec, Visualizing Embeddings, Semantic properties of embeddings, Bias and Embeddings, Evaluating Vector Models

UNIT III

Part-of-Speech Tagging: (Mostly) English Word Classes, The Penn Treebank Part-of-Speech Tagset, Part-of-Speech Tagging, HMM Part-of-Speech Tagging, Maximum Entropy Markov Models, Bidirectionality, Part-of-Speech Tagging for Other Languages.

Sequence Processing with Recurrent Networks: Simple Recurrent Networks, Applications of RNNs, Deep Networks: Stacked and Bidirectional RNNs, Managing Context in RNNs: LSTMs and GRUs, Words, Characters andByte-Pairs.

UNIT IV

Statistical Parsing: Probabilistic Context-Free Grammars, Probabilistic CKY Parsing of PCFGs, Ways to Learn PCFG Rule Probabilities, Problems with PCFGs, Improving PCFGs by Splitting Non-Terminals, Probabilistic Lexicalized CFGs, Probabilistic CCG Parsing, Evaluating Parsers, Human Parsing.

Dependency Parsing: Dependency Relations, Dependency Formalisms, Dependency Treebanks, Transition-Based Dependency Parsing, Graph-Based Dependency Parsing, Evaluation.

UNIT V

Computational Semantics, Semantic Parsing, Information Extraction: Named Entity Recognition, Relation Extraction, Extracting Times, Extracting Events and their Times, Template Filling

Text Book

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Second Edition, Pearson,2014.

Reference Book

1. Christopher D.Manning and HinrichSchutze, "Foundations of Statistical Natural Language Processing", First edition, MIT Press, 2000.

Web References

1.https://nptel.ac.in/courses/106/105/106105158/
2.https://nptel.ac.in/courses/106/106/106106211/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	-	H	-	-	-	-	-	-	H	M	M
CO2	-	-	H	M	-	-	-	-	-	-	-	-	H	-	-
CO3	H	H	-	L	-	-	-	-	L	L	-	-	H	M	L
CO4	H	-	-	-	-	-	-	L	-	-	-	-	H	-	L

OPEN ELECTIVE - III
(Refer to Concerned Department Syllabus)

19CSJ02: PROJECT WORK PHASE – II

Credits–8 **Sessional Marks:40**
L:T:P::0:0:16 **University Exam Marks:60**

Course Objectives

To expose the students to the following:

1. A glimpse into real world problems and challenges that need IT basedsolutions.
2. Creation of very precise specifications of the IT solution to bedesigned.
3. The vast literature available of the various research challenges in the field ofIT.
4. Awareness among the students of the characteristics of several domain areas where IT canbe effectivelyused.
5. How to use all concepts of IT in creating a solution for aproblem.
6. The team building, communication and management skills of thestudents.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire in-depth knowledge in the core and/or interdisciplinary area of project topic.
CO2. Critically analyse the chosen topic for arriving at conclusions.
CO3. Develop and design feasible solutions for the project topic.
CO4. Undertake research and solve real world problems in the project domain.
CO5. Apply appropriate techniques, resources and modern software tools necessary for implementing the project work.
CO6. Use project results for sustainable development of the society.
CO7. Understand the impact of project results in the context of environmental sustainability.
CO8. Understand professional and ethical responsibilities for sustainable development of society in the chosen field of project.
CO9. Function effectively as individual and a member in the project team.
CO10. Develop communication skills, both oral and written for preparing and presenting project report.
CO11. Demonstrate knowledge and understanding of cost and time analysis required for carrying out the project.
CO12. Engage in continuous learning to improve knowledge and competence in the chosen subject area of project.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	L	-	-	-	-	-	-	M	-	-	-	M	H	L
CO2	-	H	-	M	-	-	-	-	M	L	L	-	H	M	L
CO3	-	M	H	-	-	-	-	-	M	L	L	H	H	M	L
CO4	-	L	-	M	-	-	-	-	M	L	L	L	H	M	M
CO5	L	L	-	-	H	-	-	-	M	-	L	-	L	H	M
CO6	-	-	-	-	-	H	H	-	M	-	L	-	H	M	L
CO7	M	M	-	-	L	-	H	-	M	L	L	-	H	M	L
CO8	M	-	-	-	-	M	M	H	M	L	L	-	H	M	L
CO9	-	-	-	-	-	-	-	-	H	M	L	-	H	M	L
CO10	-	L	-	L	-	-	-	-	-	H	L	-	H	M	L
CO11	H	M	-	-	-	-	-	-	M	M	M	-	H	M	L
CO12	-	-	-	-	-	-	-	-	-	-	L	H	H	L	M

LIST OF OPEN ELECTIVES OFFERED BY CSE (2019-20)

OPEN ELECTIVE - I

19CST33: BASICS OF DATA STRUCTURES

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Basic concepts of arrays, strings, data structures andalgorithms.
2. Stacks, queues, lists, graphs andtrees.
3. Concepts about searching and sortingtechniques.
4. Write algorithms for solving problems with the help of fundamental datastructures.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand the basic concepts of arrays and strings.
CO2. Design ADT's for different data structures like stacks, queues, linked lists and etc.
CO3. Solve various real time problems using data structures using Stacks, Queues and linked list.
CO4. Apply Graph and tree traversal algorithms for the given real time problems.
CO5. Develop algorithms and programs for various sorting and searching techniques.

UNIT I

Introduction to Data Structures: Arrays and Strings, Algorithm Development.
Stacks and Queues: ADT Stack and its operations, Applications of Stacks: Expression Conversion and evaluation, ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue - Operations andapplications.

UNIT II

Linked Lists: Singly linked list, Doubly linked list, Circular linked list–operations and applications, linked stacks and queues.

UNIT III

Graphs: Basic Terminologies and Representations, Graph search and traversal algorithms-applications.

UNIT IV

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Heap Tree, Binary Search Tree.

UNIT V

Sorting: Introduction to internal sorting, Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, externalsorting.
Searching: linear search, binary search, Hashing.

Text Books

1. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures in C++", Illustrative edition, Galgotia publication ltd,2011.
2. Michael T. Goodrich, Roberto Tamassia, David M. Mount, "Data Structures and Algorithms in C++", Second Edition, John Wiley & Sons,2011.

Reference Books

1. Adam Drozdek, "Data Structures and Algorithms in C++", 4th Edition, Cengage Learning,2012.
2. SartajSahni, "Data Structures, Algorithms and Applications in C++", Second Edition, Silicon Press, 2005

Web References

1. https://nptel.ac.in/courses/106/102/106102064/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	M	-	L	-	-	-	-	-	H	-	-
CO2	L	H	-	-	-	-	-	-	-	-	-	-	H	-	-
CO3	L	L	H	L	M	-	-	-	-	-	-	-	M	H	-
CO4	M	L	M	L	H	L	-	L	-	-	-	-	M	H	-
CO5	L	-	L	L	H	-	M	L	-	-	-	-	M	H	-

19CST34: INTRODUCTION TO C++ PROGRAMMING

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Object Oriented Programming concepts using the C++language.
2. The principles of data abstraction, inheritance andpolymorphism.
3. Virtual functions andpolymorphism.
4. Formatted I/O and unformattedI/O.
5. The concept of exceptionhandling.

Course Outcomes

After successful completion of course the student should be able to

CO1. Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data andobjects.
CO2. Understand dynamic memory management techniques using pointers, constructors, destructors, etc
CO3. Illustrate the concept of function overloading, operator overloading, virtual functions and polymorphism.
CO4. Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.
CO5. Demonstrate the use of various OOPs concepts with the help of programs

UNIT I

Object-Oriented Thinking: Different paradigms for problem solving, Need for OOP paradigm, differences between OOP and Procedure oriented programming, Overview of OOP concepts: Abstraction, Encapsulation, Inheritance and Polymorphism.

C++ Basics: Structure of a C++ program, Data types, Declaration of variables, Expressions, Operators, Operator Precedence, Evaluation of expressions, Type conversions, Pointers, Arrays, Pointers and Arrays, Strings, Structures, References. Flow control statement- if, switch, while, for, do, break, continue, goto statements. Functions - Scope of variables, Parameter passing, Default arguments, inline functions, Recursive functions, Pointers to functions. Dynamic memory allocation and de-allocation operators-new and delete, Preprocessordirectives.

UNIT II

C++ Classes and Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction, ADT and information hiding.

UNIT III

Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual base class. Virtual Functions and Polymorphism: Static and Dynamic binding, virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtualdestructors.

UNIT IV

C++ I/O: I/O using C functions, Stream classes hierarchy, Stream I/O, File streams and String streams, Overloading operators, Error handling during file operations, FormattedI/O.

UNIT V

Exception Handling: Benefits of exception handling, Throwing an exception, The try block, Catching an exception, Exception objects, Exception specifications, Stack unwinding, Rethrowing an exception, Catching all exceptions.

Text Books

1. Herbert Schildt, "The Complete Reference C++", 4th Edition, Tata McGraw Hill,2014.
2. Walter Savitch, "Problem solving with C++: The Object of Programming", 4th Edition, Pearson Education,2002.

Reference Books

1. B. Stroutstrup,"The C++ Programming Language", 3rd Edition, Pearson Education,2000.
2. T. Gaddis, J. Walters and G. Muganda, "OOP in C++", 7th Edition, Pearson Education,2010.

R. Lafore, "Object Oriented Programming in C++", 3rdEdition, Galigotia Publications Pvt Ltd, 2004.

Web References

1.https://nptel.ac.in/courses/106/105/106105151/
2.https://nptel.ac.in/courses/106/101/106101208/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	H	-	-	-	-	-	-	-	-	-	-	H	L	-
CO2	H	-	-	-	-	-	-	-	-	-	-	-	H	L	-
CO3	-	L	H	M	-	-	-	-	-	-	-	-	L	H	-
CO4	M	H	-	-	-	-	-	-	-	-	-	-	M	M	-
CO5	L	M	-	H	-	-	-	-	-	-	-	-	M	H	-

19CSP13: ADVANCED PROGRAMMING LAB

Credits–3 **Sessional Marks:40**
L:T:P::0:0:6 **University Exam Marks:60**

Course Objectives

To expose the students to the following:

1. Programming methodologies using Clanguage.
2. Identify Object Oriented Programming concepts using the C++language.
3. Programming methodologies usingJava.
4. Develop skills to design and analyse simple linear and non-linear datastructures.

Course Outcomes

After successful completion of course the student should be able to

CO1. Formulate the algorithms for simple problems and Write iterative as well as recursive programs.
CO2. Develop programs with OOPS concepts.
CO3. Solve complex problems using java.
CO4. Develop skills to design and analyse simple linear and non-linear data structures

A. List of CPrograms

1. Write a C program to read in two integers and display one as a percentage of the other. Typically, your output should look like 20 is 50.00% of 40 assuming that the input numbers were 20 and 40. Display the percentage correct to 2 decimalplaces.
2. Take three coefficients (a, b, and c) of a Quadratic equation ($ax^2+bx+c=0$) as input and compute all possible roots. Implement a C program to output the possible roots for a given set of coefficients with appropriatemessages.
3. Given as input three integers representing a date as day, month, year, print the number day, month and year for the next day's date. Typical input: “28 2 1992” Typical output: “Date following 28:02:1992 is01:03:1992”
4. Write program for students marksgrading.
5. Implement a C program that takes an integer number as input, check whether it is PALINDROME or NOT and output the reverse of the same with suitable messages. Ex: Num: 2014, Reverse: 4102, Not aPalindrome.
6. Write a C program for the problem given below: Assume that the United States of America uses the following income tax code formula for their annual income: First US$ 5000 of income: 0% tax Next US$ 10,000 of income: 10% tax Next US$ 20,000 of income: 15% tax. An amount above US$ 35,000: 20% tax. For example, somebody earning US$ 38,000 annually would owe US$ 5000 X 0.00 + 10,000 X 0.10 + 20,000 X 0.15 + 3,000 X 0.20, which comes to US$ 4600. Write a program that uses a loop to input the income and calculate and report the owed tax amount. Make sure that your calculation is mathematically accurate and that truncation errors areeliminated.
7. Consider the following algorithm to generate a sequence of numbers. Start with an integer *n*. If *n* is even, divide by 2. If *n* is odd, multiply by 3 and add 1. Repeat this process with the new value of *n*, terminating when *n* = 1. For example, the following sequence of numbers will be generated for *n* = 22: 22 11 34 17 52 26 13 40 20 10 5 16 8 4 2 1
8. Write a program to find all (a) Armstrong number in the range of 0 and 999 Hint: An Armstrong number of three digits is an integer such that the sum of the cubes of its digits is equal to the number itself. For example, 371 is an Armstrong number since 3**3 + 7**3 + 1**3 = 371. (b) check whether a given number is a perfect number or not. Hint: A positive integer n is called a perfect number if it is equal to the sum of all of its positive divisors, excluding n itself. For example, 6 is a perfect number, because 1, 2 and 3 are its proper positive divisors and 1 + 2 + 3 = 6. The next perfect number is 28 = 1 + 2 + 4 + 7 + 14. The next perfect numbers are 496 and8128.

9. Write a program to check whether given two numbers are amicable numbers or not. Hint: Amicable numbers are two numbers so related that the sum of the proper divisors of the one is equal to the other, unity being considered as a proper divisor but not the number itself. Such a pair is (220,284); for the proper divisors of 220 are 1, 2, 4, 5, 10, 11, 20, 22, 44, 55 and 110, of which the sum is 284; and the proper divisors of 284 are 1, 2, 4, 71, and 142, of which the sum is220.
10. Write a C program to do the following computation by providing the option using the switch statement:
    a. Add twomatrices
    b. Subtract twomatrices
    c. Multiply twomatrices
    d. Check if the given matrix is magic square ornot.
    e. Print the upper and lower triangle of thematrix.
    f. Compute transpose of amatrix.
    g. Find the inverse of amatrix.
11. Write a C functions to convert decimal to (a) binary (b) octal (c)hexadecimal.
12. Write a function for each of the following and a programto
    a. Convert a given lowercase string to upper case string without using the inbuilt string function.
    b. Count number of vowels, consonants and spaces in a givenstring.
    c. Find the length of a characterstring
13. Write a C program that uses functions to perform the following operations: i. To insert a sub-string in to a given main string from a given position. ii. To delete n Characters from a given position in a given string.
14. Define a structure that will hold the data for a complex number. Using this structure, please write a program that will input two complex numbers and output the multiple of the two complex numbers. Use double variables to represent complex number components. Note: A complex number z is a number of the form z = a + bi where a and b are real numbers. The term a is called the real part of z and b is called the imaginary part of z. The multiplication operation on complex numbers is defined as: (a + bi) * (c + di) = (ac - bd) + (ad +bc)i
15. Write a program to create a file, open it, type-in some characters and count the number of characters in a file.
16. Write a program that will input a person's first name, last name, SSN number and age and write the information to a data file. One person's information should be in a single line. Use the function fprintf to write to the data file. Accept the information and write the data within a loop. Your program should exit the loop when the word 'EXIT' is entered for the first name. Remember to close the file before terminating the program. Hint: Use the function strcmp() to compare two strings.

B. List of C++programs

27. Define a class to represent a bank account which includes the following members as Data members: a) Name of the depositor b) Account Number c) Withdrawal amount d) Balance amount in theaccount
    Member Functions:
    a) To assign initial values b) To deposit an amount c) To withdraw an amount after checking the balance d) To display name andbalance.
28. Write the above program for handling n number of account holders using array ofobjects.
29. Write a C++ program to compute area of right-angle triangle, equilateral triangle, isosceles triangle using function overloadingconcept.
30. Write a C++ program to swap the values two integer members of different classes using friend function.

31. Define a class string and overload == to compare two strings and + operator for concatenation of two strings.
32. Consider an example of declaring the examination result. Design three classes student, exam and result. The student has data members such as roll no, name. Create the class exam by inheriting the student class. The exam class adds data members representing the marks scored in 5 subjects. Derive the result from exam-class and it has own data members like total, avg. Write the interactive program into model thisrelationship

C. List of Javaprograms

21. Write program(s) on use of inheritance, preventing inheritance using final, abstractclasses.
22. Write program(s) on dynamic binding, differentiating method overloading andoverriding.
23. Write program(s) on ways of implementinginterface.
24. Write a program to develop an applet that displays a simple message, for waving a Flag using Applets andThreads.
25. Write program(s) which uses the exception handling features of the language, creates exceptions and handles them properly, uses the predefined exceptions, and create ownexceptions
26. Write program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it's not a duplicate of any number already read. Display the complete set of unique values input after the user enters each newvalue.
27. Write program(s) on creating multiple threads, assigning priority to threads, synchronizing threads, suspend and resumethreads
28. Write a program to split a given text file into n parts. Name each part as the name of the original file followed by .part<n> where n is the sequence number of the partfile.
29. Write a program to create a super class called Figure that receives the dimensions of two-dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub classes override area() so that it returns the area of a rectangle and trianglerespectively.
30. Write a program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every threeseconds
31. Design a simple calculator which performs all arithmetic operations. The interface should look like the calculator application of the operating system. Handle the exceptions ifany.
32. Write a program to handle mouseevents
33. Write a program to handle keyboardevents
34. Write a program that allows conduction of object type examination containing multiple choice questions, and true/false questions. At the end of the examination when the user clicks a button the total marks have to be displayed in the form of themessage.
35. Write a program that creates menu which appears similar to the menu of notepad application of the Microsoft windows or any editor of yourchoice.
36. Write a program that creates dialog box which is similar to the save dialog box of the Microsoft windows or any word processor of yourchoice.
37. Write a program that correctly implements producer consumer problem using the concept of inter threadcommunication
38. Write a program to find and replace pattern in a givenfile.

D. List of Data Structureprograms

39. Write a program that uses stack operations to convert a given infix expression into its postfix Equivalent, Implement the stack using anarray
40. Write a program to reverse the elements in the stack usingrecursion.
41. Write a program to implement the simple Queue and circularoperations

42. Write a program that uses functions to perform the following: a) Create a singly linked list of integers. b) Delete a given integer from the above linked list. c) Display the contents of the above list afterdeletion.
43. Write a program that uses functions to perform the following: a) Create a doubly linked list of integers. b) Delete a given integer from the above doubly linked list. c) Display the contents of the above list afterdeletion
44. Write a program to implement Circular linked listoperations
45. Determine the indegree and outdegree of all the vertices of a givengraph.
46. Write programs for implementing the following graph traversalalgorithms:
    a. Depth firsttraversal
    b. Breadth firsttraversal
47. Determine whether the given graph is connected graph ornot.
48. Write a program that uses functions to perform the following: a) Create a binary search tree of characters. b) Traverse the above Binary search tree recursively inPostorder.
49. Write a program that uses functions to perform the following: a) Create a binary search tree of integers. b) Traverse the above Binary search tree non-recursively ininorder.
50. Write a program to implementB-tree
51. Write programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Bubble sort b) Insertion sort
52. Write programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Quick sort b) Selectionsort
53. Write programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Merge sort b) Heapsort
54. Write a program to search for a given elementusing
    a. Linearsearch
    b. Binarysearch

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	L	H	L	L	-	-	-	L	-	-	-	-	M	H	L
CO2	-	L	H	-	M	-	-	L	-	-	-	-	M	H	L
CO3	-	L	-	H	H	-	-	L	-	-	-	-	M	H	L
CO4	-	L	H	L	-	-	-	L	-	-	-	-	M	H	L

19CST35: FUNDAMENTALS OF COMPUTER ORGANIZATION

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Concepts of the basic structure and operation of the functional modules of a digitalcomputer.
2. Analysis and design the functional modules, memory & I/O modules and pipelined processors in a digitalcomputer.
3. Apply contextual knowledge to societal relatedissues.

Course Outcomes

After successful completion of course the student should be able to

CO1. Demonstrate knowledge on Computer Arithmetic units, Register Transfer and Computer Instructions, Design of Control Unit, Input Output Organization and Memory system, Pipelining and Multiprocessing.
CO2. Analyse the functional units of a digital computer.
CO3. Design the functional modules in a digital computer - Arithmetic Units, Memory andI/O.
CO4. Investigate the performance of memory, I/O, and pipelinedprocessors.
CO5. Select appropriate techniques of I/O, Pipelining and Multiprocessing to solve computing problems.
CO6. Apply contextual knowledge of computer systems development to societal applications.

UNIT I

Register Transfer And Microoperations: Register transfer, Bus and memory transfers, Arithmetic microoperations, Logic microoperations, Shift microoperations, Arithmetic logic shift unit.
Computer Arithmetic: Fixed point representation, Floating point representation, Addition and subtraction, Binary multiplication algorithms, Binary division algorithms.

UNIT II

Basic Computer Organization and Design: Instruction codes, Computer registers, Computer instructions, Instruction formats, Addressing modes, Timing and control, Instruction cycle, Memory reference instructions, Input - Output and Interrupt.
Micro Programmed Control: Control memory, Address sequencing, Design of control unit, Hardwired control, Microprogrammed control.

UNIT III

Input-Output Organization: Peripheral devices, Input-Output interface, Modes of transfer, Priority interrupt, Direct Memory Access, Input-Output Processor (IOP).

UNIT IV

The Memory System: Semiconductor RAM memories – Internal organization, Static memories, Synchronous and Asynchronous DRAMs, Structure of larger memories; Read-Only memories, Cache memories – Mapping functions; Secondary Storage – Magnetic Disks, Optical Disks.

UNIT V

Pipeline and Vector Processing: Parallel processing, Pipelining, Arithmetic pipeline, Instruction pipeline, Vector processing, Array processors.
Multiprocessors: Characteristics of multiprocessors, Interconnection structures, Inter-processor arbitration, Inter-processor communication and synchronization.

Text Books

1. Morris Mano, "Computer System Architecture", Third Edition, Pearson Education,2007.
2. Carl V. Hamacher, Zvonko G. Vranesic and Safwat G. Zaky, "Computer Organization", Fifth Edition,McGraw-Hill,2002.

Reference Books

1. William Stallings, "Computer Organization and Architecture: Designing For Performance", Seventh Edition, Pearson Education,2007.
2. John P. Hayes, "Computer Architecture and Organization", Third Edition, McGraw-Hill,2002

Web References

1. https://nptel.ac.in/courses/106/106/106106166/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	L	-	-	-	-	-	-	-	-	-	-	H	L	-
CO2	-	H	-	L	-	-	-	-	-	-	-	-	H	-	-
CO3	-	L	H	-	-	-	-	-	-	-	-	-	H	L	-
CO4	-	-	-	H	-	-	-	-	-	-	-	-	H	L	-
CO5	-	-	-	M	H	-	-	-	-	-	-	-	M	H	-
CO6	-	-	-	-	M	-	-	-	-	-	-	-	H	M	-

OPEN ELECTIVE - II

19CST36: BASICS OF COMPUTER NETWORKS

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Modern network architectures from a design and performance perspective.
2. Major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs(WLANs).
3. Network programming and WLANmetrics.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand and explore the basics of Computer Networks and Various Protocols.
CO2. Administrate a network and schedule flow of information.
CO3. Examine the network security issues in Mobile and ad hocnetworks.
CO4. Demonstrate the TCP/IP and OSI fashions with merits and demerits.
CO5. Evaluate the shortest path by using Routingalgorithms.
CO6. Design the various layer protocols.

UNIT I

Introduction: Introduction to computer networks, network hardware, Reference models. Overview of Physical layer

Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding windowprotocols.

UNIT II

Medium Access Sublayer: Channel allocation problem, multiple access protocols, IEEE standard 802 for LANs and MANs, Bridges, High-speed LANs, Satellite network.

UNIT III

Network Layer: Design issues, routing algorithms, congestion control algorithms, internetworking, the network layer in the internet, the network layer in ATMnetwork.

UNIT IV

Transport Layer: Transport services, elements of transport protocols, a simple transport protocol, the internet transport protocols, (TCP and UDP), the ATN ALL layer protocols, performance issues.

UNIT V

Application Layer: Network security, DNS – Domain Name System, SNMP –Simple Network Management protocol, Electronic Mail, Usenet news, the World Wide Web (WWW), Multimedia.

Textbooks

1. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks", 5th Edition, Pearson, 2011.

Reference Books

1. Behrouz A. Forouzan, "Data Communication and Networking", 5th Edition, TMH, 2013

Web References

1.https://nptel.ac.in/courses/106/105/106105081/
2.https://nptel.ac.in/courses/106/106/106106091/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	L	-	-	-	-	-	H	-	-
CO2	-	H	H	-	-	-	M	-	-	-	-	-	H	-	-
CO3	-	M	-	H	-	M	M	-	-	-	-	-	H	-	M
CO4	-	H	-	-	-	-	-	-	-	-	M	-	H	-	-
CO5	L	M	-	H	-	-	-	-	-	-	-	-	L	M	-
CO6	-	-	H	M	-	-	-	-	L	L	-	-	L	M	H

19CST37: INTRODUCTION TO PROGRAMMING WITH PYTHON

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. The core syntax and semantics of Python programminglanguage.
2. The need for working with the strings andfunctions.
3. Illustrate the process of structuring the data using lists, dictionaries, tuples andsets.
4. The use of regular expressions and built-in functions to navigate the filesystem.
5. The Object-oriented Programming concepts inPython.

Course Outcomes

After successful completion of course the student should be able to

CO1. Learn the fundamental Python syntax, semantics and control flow statements.
CO2. Express proficiency in handling strings and functions.
CO3. Realise Python programs for file systems and various data structures like lists, dictionaries, tuples and sets.
CO4. Formulate regular expressions for real world applications.
CO5. Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.

UNIT I

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, mnType Conversions, The type() Function and Is Operator, Dynamic and Strongly Typed Language, Control Flow Statements, The if Decision Control Flow Statement, The if…else Decision Control Flow Statement, The if…elif…else Decision Control Statement, Nested if Statement, The while Loop, The for Loop, The continue and break Statements, Catching Exceptions Using try and except Statement, Functions, Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

UNIT II

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings, Lists, Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, The del Statement.

UNIT III

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, The del Statement, Tuples and Sets, Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Tuple Methods, Using zip() Function, Sets, Set Methods, Traversing of Sets, Frozenset.

UNIT IV

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os.pathModules, Regular Expression Operations, Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with glob Module.

UNIT V

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in

Python, The Constructor Method, Classes with Multiple Objects, Class Attributes versus Data Attributes, Encapsulation, Inheritance, ThePolymorphism

Text Books

1. Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13:978-0815394372

Reference Books

1. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", 1st Edition, O'Reilly Media, 2016. ISBN-13: 978-1491912058
2. AurelienGeron, Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition,O'Reilly Media, 2017. ISBN – 13: 978-1491962299.

Web References

1. https://nptel.ac.in/courses/106/106/106106182/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	-	-	-	-	-	-	-	-	H	-	-
CO2	H	M	-	-	-	-	L	-	-	-	-	-	H	L	-
CO3	-	L	H	-	M	-	-	L	-	-	-	-	M	H	-
CO4	-	M	H	-	-	-	-	-	-	-	-	-	H	L	-
CO5	-	M	H	-	L	-	L	L	-	-	-	-	M	H	-

19CST38: INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Basics of databasesystems.
2. The different issues involved in the design and implementation of a databasesystem.
3. The physical and logical database designs, database modelling, relational, hierarchical, and network models.
4. Use data manipulation language to query, update, and manage adatabase.
5. Normalization, indexing, transaction management and concurrencycontrol.

Course Outcomes

After successful completion of course the students should be able to

CO1. Understand the basics of database systems, recovery techniques and transaction processing system.
CO2. Write relational algebra expressions for a given query and optimize the developed expressions.
CO3. Design ER model for given database specifications.
CO4. Perform normalization for the given schema and various operations of indexing.
CO5. Construct the SQL queries for given specifications and Optimize its execution using Query optimization algorithms for a given query.
CO6. Demonstrate the isolation property, including locking, time stamping based on concurrency control and serializability of scheduling.

UNIT I

Overview of Database Systems: Introduction, File Systems versus DBMS, Advantages of DBMS, Describing and Storing Data in a DBMS: The Relational Model, Levels of Abstraction in a DBMS, Data Independence, Database Architecture, Structure of a DBMS, Database users.

UNIT II

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model: Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation.

The Relational Model: Introduction, Creating and Modifying Relations Using SQL, Integrity **Constraints over Relations:** Key Constraints, Foreign Key Constraints, General Constraints, Enforcing Integrity Constraints, Querying Relational Data

Introduction to Views: Views, Data Independence, Security, Updates on Views, Destroying/Altering Tables and Views.

UNIT III

SQL: The Form of a Basic SQL Query: Examples of Basic SQL Queries - Expressions and Strings in the SELECT Command, UNION, INTERSECT, and EXCEPT, Nested Queries: Introduction to Nested Queries - Correlated Nested Queries, Aggregate Operators: The GROUP BY and HAVING Clauses, Joins

Normalization: Purpose of normalization (or) schema refinement, concept of functional dependency, normal forms (1NF, 2NF, 3NF, BCNF & 4NF), Lossless join and Dependency preservation decomposition.

UNIT IV

Overview of Transaction Management: The ACID Properties, Transactions and Schedules
Concurrent Execution of Transactions: Concurrent Execution, Serializability, Two phase Locking (2PL), Strict 2PL.
Concurrency Control: Serializability, View Serializability
Lock Management: Types, Lock conversions, dead locks, Concurrency Control without Locking: Time stamp based concurrency control, Multiple Granularity locking.

UNIT V

Overview of Storage And Indexing: Data on External Storage, File Organizations and Indexing, Clustered Indexes, Primary and Secondary Indexes, Index Data Structures: Hash-Based Indexing, Tree-Based Indexing, ISAM, B+ Trees.

Text Books

1. Raghu Ramakrishnan, Johannes Gehrke, "Database management Systems", Third Edition,2003.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 6th Edition, McGraw-Hill,2010.

Reference Book

1. R. Elmasri and S. Navathe, "Fundamentals of Database Systems", Global Edition, Pearson Education, 2016.

Web References

1.https://nptel.ac.in/courses/106/104/106104135/
2.https://nptel.ac.in/courses/106/105/106105175/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	L	-	-	-	-	-	-	-	-	-	H	-	-
CO2	L	H	-	L	M	-	-	-	-	-	-	-	H	-	-
CO3	L	M	H	-	M	-	-	-	-	-	-	-	H	M	-
CO4	L	L	-	M	H	-	-	-	-	-	-	-	H	-	-
CO5	-	L	M	H	M	-	-	-	-	-	-	-	H	M	-
CO6	L	M	M	L	H	M	-	-	-	-	-	-	H	M	L

19CST39: INTRODUCTION TO CLOUD COMPUTING

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Fundamental concepts in the area of cloudcomputing.
2. Applications of cloudcomputing.
3. Cloud architecture andmodel.
4. Analyse the concept of virtualization and design of cloudservices.
5. Illustrate the familiarity of the lead players in thecloud.
6. Evaluate the features of CloudSimulator.

Course Outcomes

After successful completion of course the student should be able to

CO1. Define cloud computing and related concepts.
CO2. Know the key dimensions of the challenges and benefits of Cloud Computing.
CO3. Comprehend the hardware necessary for cloud computing and how components fit together.
CO4. Determine the suitability of in-house v/s hosted solutions.
CO5. Understand the systems, protocols and mechanisms to support cloud computing and develop applications for cloud computing.
CO6. Identify numerous opportunities exist for practitioners seeking to create solutions for cloud computing.

UNIT I

Systems Modelling, Clustering and Virtualization: Distributed System Models and Enabling Technologies. Computer Clusters for Scalable Parallel Computing. Virtual Machines and Virtualization of Clusters and Data centres.

UNIT II

Foundations: Introduction to Cloud Computing, Migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era. The Enterprise Cloud Computing Paradigm.

UNIT III

Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS / SAAS): Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service. Secure Distributed Data Storage in Cloud Computing. Aneka, Comet Cloud, T-Systems, Understanding Scientific Applications for CloudEnvironments

UNIT IV

Monitoring, Management and Applications: Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Production for HPC on Clouds, Best Practices in Architecture Cloud Applications in the AWS cloud, Building Content Delivery networks Clouds

UNIT V

Governance and Case Studies: Organisational Readiness and Change management in the Cloud age. Data Security in the Cloud, Legal issues in Cloud computing. Achieving Production Readiness for Cloud Services

Text Books

1. Rajkumar Bi, Cloud Computing: "Principles and Paradigms", John Wiley & Sons Inc..,2011.
2. Kal Hwang. GeoffeiyC.Fox. Jack J.Dongarra, "Distributed and Cloud Computing", Elsevier,2012

Reference Books

1. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw Hill,2011.
2. GautamShroif, "Enterprise Cloud Computing", Cambridge University Press,2010.

Web References

1. https://nptel.ac.in/courses/106/105/106105167/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	-	-	-	-	-	-	-	-	M	-	-	H	-	-
CO2	H	-	-	-	-	-	-	-	-	M	-	-	H	-	-
CO3	H	-	-	-	M	-	-	-	-	-	-	-	M	H	-
CO4	L	H	-	-	-	-	-	-	-	M	-	-	H	-	L
CO5	H	-	-	-	M	-	-	-	-	-	-	-	H	-	M
CO6	-	-	H	H	M	-	-	-	-	-	-	-	M	-	H

OPEN ELECTIVE - III

19CST40: INTRODUCTION TO CYBER SECURITY

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following

1. Instigate cyber threats and cyber security and to facilitate the awareness in the times of growing cyber-crimeepisodes.
2. Learning how cyber security is going to help to understand the implications ofcybercrime.
3. Facilitating an idea about the legal perspectives and laws related to cybercrimes in Indiancontext.
4. Familiarize how to apply security and privacy methods in development of modern applications and in organizations to protect people and to preventcybercrimes.

Course Outcomes

After successfully completion of course the student should be able to

CO1. Analyze various aspects of Cyber security, Cyber-crimes and its related laws in Indian and Globalact.
CO2. Understand how cyber security is going to help the implications of cybercrime.
CO3. Examine the legal perspectives and laws related to cybercrimes in Indian context.
CO4. Apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cyber-crimes.

UNIT I

Introduction to Cyber Crimes: Introduction, Definition, Origin, Cyber Crime and Information Security, Cyber Criminals, Classifications of Cyber Crimes, The Legal Perspectives and Indian Perspective, Cyber Crime and Indian ITA 2000, Global Perspective on Cyber Crimes.

Cyber Offenses: Introduction, Criminals Planning on Attacks, Social Engineering, Cyber Stalking, Cyber Café and Crimes, Botnets.

UNIT II

Tools and Methods used in Cyber Crime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan horses and Backdoors, Steganography, DoS and DDoS attacks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

UNIT III

Cyber Crimes and Cyber Security-Legal Perspectives: Introduction, Cyber Crime and the legal landscape around the world. Cyber Laws in Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Consequences of not addressing the weakness in IT Act, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyberlaw, Technology and Students in India Scenario.

UNIT IV

Cyber Security-Organizational Implications: Introduction, Cost of Cyber Crimes and IPR issues, Web Threats for Organizations - Evils and Perils, Security and Privacy Implications from Cloud Computing, Social Media Marketing-Security Risks and Perils for Organizations.

UNIT V

Cyber Security-Organizational Implications: Social Computing and Associated Challenges for Organizations, Protecting People's Privacy in Organization, Organizational Guidelines for Internet

Usage, Safe Computing and Usage Policy, Incident Handling and Best Practices, Media and Asset Protection.

Text Books

1. Nina Gobole, SunitBelapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives," 1st Edition, Wiley India, 2011.

Reference Books

1. Robert Bird, Jonathan J. Darrow, Gerald R. Ferrera, Jacqueline Klosek, Margo E. K. Reder,Stephen D. Lichtenstein, Jeffrey Aresty, "Cyber Law: Text and Cases", 3rd Edition, Cengage Learning,2012.
2. Vivek Sood, "Cyber Law Simplified", 1st Edition, Tata McGraw-Hill,2012.
3. Prashant Mali, "Cyber Law and Cyber Crimes", Snow White Publications Pvt. Ltd.,2013.

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	H	-	H	-	-	-	-	-	L	-	-	H	-	-
CO2	H	-	-	H	-	L	-	-	-	-	-	-	H	-	
CO3	H	H	-	-	-	-	-	-	-	-	-	-	H	-	-
CO4	L	L	H	M	H	H	L	L	-	-	-	-	M	H	-

19CST41: INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. About various AI domains and problem solvingtechniques.
2. Basic proficiency in representing difficult real life problems in a state space representation so as to solve them uses AI techniques likesearching.
3. The concept of Knowledge representations, its various approaches and issues, Non-monotonic environment and Symbolic Reasoning inUncertainty.
4. Formal foundation on Strong & Weak slot & fillerstructures.

Course Outcomes

After successful completion of course the student should be able to

CO1. Recognize various AI domains and identify problem solving techniques to apply them in real timeapplications.
CO2. Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search based techniques to solve them.
CO3. Represent Knowledge in propositional calculus and Predicate calculus.
CO4. Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
CO5. Get wide exposure about strong and weak slot & fillers available.

UNIT I

Introduction to AI: The AI Problems-The Underlying Assumption-What is an AI Technique-Tic-Tac-Toe game playing, Problems, Problem Spaces and Search-Defining the problem as a State Space Search- Production Systems-Control Strategies-Heuristic Search, Issues in the design of search program.

UNIT II

Heuristic search techniques: Generate and Test, Hill Climbing-Simple Hill Climbing-Steepest Ascent Hill Climbing-Simulated Annealing, Best-first-search-OR Graphs-A* Algorithm-Agenda DrivenSearch.

UNIT III

Knowledge representation: Knowledge Representation Issues- Representations in Mappings, Approaches to Knowledge representation, Issues in Knowledge Representation.

Predicate logic: Representing simple facts in Logic, representing instance and is a Relationships, Computable Function and Predicates, Resolution-Conversion to Clause form-The basics of Resolution-Resolution in Propositional Logic-Resolution in Predicate Logic, Natural deductions.

UNIT IV

Symbolic Reasoning under Uncertainty: Introduction to non-monotonic reasoning, logics for non-monotonic reasoning-Default Reasoning-Minimalist Reasoning, Implementation issues, Implementation in depth first search-Dependency directed Backtracking-Justification Based Truth Maintenance Systems-Logic-Based Truth Maintenance Systems- Implementation in Breadth first search.

UNIT V

Weak slot and Filler Structures: Semantic Nets- Intersection Search-Representing Non-binary Predicates-Partitioned Semantic Nets, Frames-Frames as Sets and Instances-Slots as Full-Fledged Objects-Slot-Values as Objects-Inheritance Revisited.

Textbooks

1. Elaine Rich, Kelvin Knight and Shiva Shankar B.Nair, "Artificial Intelligence", 3rd Edition, Tata McGrawHill, July, 2017.

Reference Books

1. Saroj koushik, "Artificial Intelligence", 1st Edition, Engage learning,2011
2. Elakumar, "Artificial Intelligence", 1st Edition, I.K.International publishing house,2010.

Web References

1.https://nptel.ac.in/courses/106/105/106105077/
2.https://nptel.ac.in/courses/106/105/106105079/
3.https://nptel.ac.in/courses/106/106/106106140/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	L	-	-	-	-	-	H	-	L
CO2	-	H	-	M	-	-	-	L	-	-	-	-	H	L	L
CO3	H	-	-	-	-	-	-	-	-	-	-	-	H	-	-
CO4	-	H	-	M	-	-	-	-	-	-	-	-	H	-	-
CO5	H	-	M	-	-	-	-	L	-	-	-	-	H	L	-

19CST42: INTRODUCTION TO JAVA PROGRAMMING

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methodsetc.
2. The fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handlingmechanisms.
3. The principles of inheritance, packages and interfaces.

Course Outcomes

After successful completion of course the student should be able to

CO1. Identify classes, objects, members of a class and relationships among them needed for a specific problem.
CO2. Write Java application programs using OOP principles and proper program structuring.
CO3. Demonstrate the concepts of polymorphism and inheritance.
CO4. Compose Java programs to implement error handling techniques using exception handling and understand the importance of multi-threading.
CO5. Build the internet-based dynamic applications using the concept of applets.
CO6. Understand the process of graphical user interface design and implementation using AWT

UNIT I

The History and Evolution of Java: Java's Lineage, The Creation of java, how java changed the internet, Java's magic: The byte code, Servlets: java on the server side, java Buzzwords, Evolution of java.

An Overview of Java: Object Oriented Programming, Two control statements, Using blocks of codes, Lexical issues, and the java class Libraries.

Data Types, Arrays and Variables: Primitive Types, Integers, Floating-point Types, Characters, Booleans, literals, variables, Type conversion and casting, Automatic Type Promotion in Expressions, Arrays, strings, Pointers.

UNIT II

Operators: Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logic operators, The assignment operator, The ? Operator, Operator Precedence, Using Parentheses.

Control Statements: Java's selection Statements, Iteration statements, Jump Statements.

Introducing Classes: Class Fundamentals, Declaring Objects, Assuming Object reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The Finalize() method, A Stack class. Overloading Methods, Using Object as Parameter, Argument Passing, Returning Objects, Recursion, Introducing Access control, Understanding static, Introducing Nested and Inner classes, Exploring the String class, Using Command line Arguments, Varargs: variable-Length Arguments.

UNIT III

Inheritance: Basics, Using super, creating a multi-level hierarchy, when constructors are executed, method overriding, dynamic method dispatch, using abstract class, using final with inheritance, the object class.

Packages and Interfaces: Packages, Access protection, Importing Packages, Interfaces, Default Interfaces, Default interface methods, Use static methods in an Interface, Final thoughts on Packages and interfaces.

Exception Handling: Exception handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try statements, throw, throws, finally, Java Built-in Exceptions, Creating your own exception subclasses, Chained Exceptions, Three Recently added Exceptions features, Using Exceptions.

UNIT IV

Multithreaded Programming: The java Thread Model, The main thread , Creating Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Interthread Communication, Suspending, resuming and stopping threads, Obtaining a thread state, Using Multithreading.

I/O, Applets, and Other Topic: I/O basics, Reading Console input, Writing console Output, The PrintWriter class, Reading and writing files, Automatically closing a file, Applet fundamentals, enumerations type wrappers auto boxing annotations, Generics: The general form of a generics class, creating a generic method, generics interfaces.

UNIT V

Introduction the AWT: Working with windows, graphics and Text: AWT classes, window fundamentals, working with frame windows, creating a frame window in a an AWT Based applet, creating a window program, displaying information within a window, Graphics, working with color, setting the paint mode, working with fonts, managing text output using font metrics,.

Using AWT controls, Layout Mangers, and Menus: AWT control fundamentals, Labels, using buttons, applying check boxes, check box group, choice controls, using lists, Managing scroll bars, using a Text field, Using a Text area, understanding layout managers, Menu bars and Menus, dialog boxes, file dialog, Overriding paint().

Text Books

1. Herbert Schildt, “Java, The Complete Reference”, 9th Edition, McGraw Hill Education, 2016.

Reference Books

1. B. Eswara Reddy, P. Raghavan, T. V. Suresh Kumar, “Programming with Java”, Pearson Edition, 2011
2. Herbert Schildt and Dale Skrien, “Java Fundamentals - A Comprehensive Introduction”, Special Indian Edition, McGrawHill, 2013.

Web References

1. https://nptel.ac.in/courses/106/105/106105191/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	H	M	-	-	-	-	-	-	-	-	-	-	M	H	-
CO2	L	M	H	-	-	-	-	-	-	-	-	-	M	H	-
CO3	-	M	H	L	-	-	-	-	-	-	-	-	M	H	-
CO4	-	H	M	-	-	-	-	-	-	-	-	-	M	H	-
CO5	L	-	H	-	M	-	-	-	-	-	-	-	M	H	-
CO6	M	L	H	-	-	-	-	-	-	-	-	-	H	M	-

19CST43: FUNDAMENTALS OF INTERNET OF THINGS

Credits–3 **Sessional Marks:30**
L:T:P::3:0:0 **University Exam Marks:70**

Course Objectives

To expose the students to the following:

1. Concepts IoT andpython.
2. IoT Marketperspective.
3. IoT Architecture, Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation inIoT.

Course Outcomes

After successful completion of course the students should be able to

CO1. Analyse the vision of IoT from a global context.
CO2. Understand the vision of IoT from a global context.
CO3. Determine the Market perspective of IoT.
CO4. Use devices like Raspberry PI-Interfaces, Gateways and Data Management in IoT.
CO5. Build architecture for IoT.

UNIT I

Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs. IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels

UNIT II

IoT and M2M: Software defined networks, network function virtualization, difference between SDN and NFV for IoT, Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, and SNMP NETOPEER

UNIT III

Introduction to Python: Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT IV

IoT Physical Devices and Endpoints: Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT V

IoT Physical Servers and Cloud Offerings: Introduction to Cloud Storage models and Communication APIs, Web server for IoT, Cloud for IoT

Text Books

1. ArshdeepBahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach”, Orient Blackswan Private Limited - New Delhi, University Press, 2015.
2. Matt Richardson and Shawn Wallace, “Getting Started with Raspberry Pi”, O’Reilly, Maker Media Inc,2013.

Reference Books

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press,2014.
2. Michael Miller, "The Internet of Things", First Edition, Pearson,2015.
3. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", Wiley,2013.

Web References

1. https://nptel.ac.in/courses/106/105/106105166/

Course Outcomes – Program Outcomes – Program Specific Outcomes (CO-PO-PSO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	H	-	M	-	-	-	-	-	-	-	-	H	-	-
CO2	H	-	-	-	M	-	L	-	-	-	-	-	H	-	-
CO3	M	-	-	-	-	-	H	-	-	M	-	L	H	-	-
CO4	-	-	-	-	H	-	-	-	-	-	-	-	L	H	M
CO5	-	M	H	-	-	-	-	-	-	-	-	-	L	-	H