R-20

SYLLABUS BOOK

for

B. Tech

COMPUTER SCIENCE AND ENGINEERING

(*Applicable for batches admitted from 2020-21*)

PRAGATI ENGINEERING COLLEGE

(AUTONOMOUS)

Approved by **AICTE**, Permanently Affiliated to **JNTUK, Kakinada**,
Accredited by **NBA**, **NAAC** with –**A**‖ Grade
Recognized by **UGC 2(f)** and **12(b)** under UGC act, 1956
1-378, ADB Road, Surampalem,Near Peddapuram, E.G.Dist, A.P.–533 437

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

I Year I Semester							
S.No	**Category**	**Course Code**	**Course Title**	**Hours per Week**			**Credits**
				L	**T**	**P**	**C**
1	HSC	20HE1T01	Professional Communicative English	3	0	0	3
2	BSC	20BM1T01	Differential Equations and NumericalMethods	3	0	0	3
3	BSC	20BP1T02	Applied Physics	3	0	0	3
4	ESC	20CS1T01	Programming for Problem Solving using C	3	0	0	3
5	ESC	20IT1L01	Computer Engineering Workshop	1	0	4	3
6	HSC	20HE1L01	Professional Communicative English Laboratory	0	0	3	1.5
7	BSC	20BP1L02	Applied Physics Laboratory	0	0	3	1.5
8	ESC	20CS1L01	Programming for Problem Solvingusing C Laboratory	0	0	3	1.5
Total Credits							**19.5**

I Year II Semester							
S.No	**Category**	**Course Code**	**Course Title**	**Hours per Week**			**Credits**
				L	**T**	**P**	**C**
1	BSC	20BM2T02	Linear Algebra and Partial Differential Equations	3	0	0	3
2	BSC	20BC2T02	Applied Chemistry	3	0	0	3
3	ESC	20EC2T02	Computer Organization	3	0	0	3
4	ESC	20CS2T03	Python Programming	3	0	0	3
5	ESC	20IT2T01	Data Structures	3	0	0	3
6	BSC	20BC2L02	Applied Chemistry Laboratory	0	0	3	1.5
7	ESC	20CS2L03	Python Programming Laboratory	0	0	3	1.5
8	ESC	20IT2L02	Data Structures Laboratory	0	0	3	1.5
9	MC	20BE2T01	Environmental Science	2	0	0	0
Total Credits							**19.5**

II Year I Semester							
S.No	**Category**	**Course Code**	**Course Title**	**Hours per Week**			**Credits**
				L	**T**	**P**	**C**
1	BSC	20BM3T03	Transforms and Vector Calculus	3	0	0	3
2	PCC	20CS3T04	Advanced Data Structures through C	3	0	0	3
3	PCC	20IT3T04	Operating Systems	3	0	0	3
4	PCC	20IT3T02	Database Management Systems	3	0	0	3
5	PCC	20IT3T03	Mathematical Foundations of Computer Science	3	0	0	3
6	PCC	20CS3L04	Advanced Data Structures through C Laboratory	0	0	3	1.5
7	PCC	20IT3L05	Operating Systems Laboratory	0	0	3	1.5
8	PCC	20IT3L04	Database Management Systems Laboratory	0	0	3	1.5
9	SOC	20CS3S01/ 20CS3S02	Applications of Python-NumPy/ Web Application Development using Full Stack- Frontend Development- Module – I	0	0	4	2
10	MC	20HM3T05	Constitution of India	2	0	0	0
Total Credits							**21.5**

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II Year II Semester							
S.No	**Category**	**Course Code**	**Course Title**	**Hours per Week**			**Credits**
				L	**T**	**P**	**C**
1	BSC	20BM4T05	Probability and Statistics	3	0	0	3
2	PCC	20CS4T05	Software Engineering	3	0	0	3
3	PCC	20CS4T06	Formal Languages and Automata Theory	3	0	0	3
4	ESC	20CS4T07	Java Programming	3	0	0	3
5	HSC	20HM4T01	Managerial Economics and Financial Analysis	3	0	0	3
6	PCC	20CS4L05	Software Engineering Laboratory	0	0	3	1.5
7	PCC	20CS4L06	R Programming Laboratory	0	0	3	1.5
8	ESC	20CS4L07	Java Programming Laboratory	0	0	3	1.5
9	SOC	20CS4S03/ 20CS4S04	**Skill Oriented Course - II** Applications of Python-Pandas/ Web Application Development using Full Stack- Frontend Development- Module – II	0	0	4	2
10	MC	20HM4T06	Essence of Indian Traditional Knowledge	2	0	0	0
Total Credits							**21.5**
Internship 2 Months (Mandatory) during summer vacation							
Honors course 20CS4H01 Python for Data Science				4	0	0	4
Minors course 20CS4M01 Operating Systems$				3	0	2	4

$- Integrated Course

III B. Tech – I Semester						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	20CS5T08	Computer Networks	3	0	0	3
2	20CS5T09	Design and Analysis of Algorithms	3	0	0	3
3	20CS5T10	Data Warehousing and Data Mining	3	0	0	3
4	20EE5T13 20ME5T29 20EC5T15 20HM5T03	**Open Elective-I** 1. Renewable Energy Engineering 2. Optimization Techniques 3. Principles of Communication Engineering 4. Entrepreneurship	3	0	0	3
5	20CS5T11 20CS5T12 20CS5T13 20IT5T09	**Professional Elective-I** 1. Human Computer Interaction 2. Software Project Management 3. Distributed Systems 4. Advanced Unix Programming	3	0	0	3
6	20CS5L08	Data Warehousing and Data Mining Laboratory	0	0	3	1.5
7	20CS5L09	Computer Networks Laboratory	0	0	3	1.5
8	20CS5S06 20IT5S05	**Skill Oriented Course - III** Animation course: Animation Design / Continuous Integration and Continuous Delivery using DevOps	0	0	4	2
9	20HE5T02	**Employability Skills-I**	2	0	0	0
10	20CS5I01	Summer Internship 2 Months(Mandatory) after second year(to be evaluated during V semester	0	0	0	1.5
11	20CS5P01	Community Service Project	0	0	0	4
Total credits						**25.5**
Honors course 20CS5H02 Artificial Intelligence			4	0	0	4
Minors course 20CS5M02 Software Engineering$			3	0	2	4

$- Integrated Course

III B. Tech – II Semester						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	20AM6T02	Machine Learning	3	0	0	3
2	20CS6T14	Compiler Design	3	0	0	3
3	20IT6T10	Cryptography and Network Security	3	0	0	3
4	20CS6T15 20DS6T02 20CS6T16 20CS6T21	**Professional Elective-II** 1. Mobile Computing 2. Big Data Analytics 3. Object Oriented Analysis and Design 4. Network Programming	3	0	0	3
5	20CE6T35 20EE6T19 20ME6T25 20EC6T26	**Open Elective-II** 1. Disaster Management 2. Fundamentals of Electric Vehicles 3. Introduction to Automobile Engineering 4. Sensors and Transducers	3	0	0	3
6	20AM6L02	Machine Learning using Python Laboratory	0	0	3	1.5
7	20CS6L10	Compiler Design using C Laboratory	0	0	3	1.5
8	20IT6L07	Cryptography Network Security Laboratory	0	0	3	1.5
9	20HE6S01	**Skill Oriented Course - IV** Soft skills and inter personal communication	1	0	2	2
10	20HM6T03	**Employability Skills-II**	2	0	0	0
Total credits						**21.5**
Industrial/Research Internship(Mandatory) 2 Months during summer vacation						
Honors course 20CS6H03 Natural Language Processing			4	0	0	4
Minors course 20CS6M03 Computer Networks$			3	0	2	4
20CS6H04 **Honors courses through SWAYAM**			0	0	0	2
20CS6M04 **Minors courses through SWAYAM**			0	0	0	2

$- Integrated Course

IV B. Tech –I Semester						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	20CS7T12 20CS7T13 20CS7T14 20CS7T15	**Professional Elective-III** 1. Cloud Computing 2. Neural Networks and Soft Computing 3. Ad-hoc and Sensor Networks 4. Computer Forensics	3	0	0	3
2	20AM7T03 20CS7T16 20AI7T02 20CS7O01	**Professional Elective-IV** 1. Deep Learning 2. Social Networks &Semantic Web 3. Computer Vision 4. MOOCS-NPTEL/SWAYAM	3	0	0	3
3	20IT7T16 20CS7T17 20CS7T32 20CS7O02	**Professional Elective-V** 1. Blockchain Technologies 2. Wireless Network Security 3. Ethical Hacking 4. MOOCS-NPTEL/SWAYAM	3	0	0	3
4	20EE7T29 20ME7T28 20EC7T40 20HM7T09	**Open Elective-III** 1. Battery Management Systems and Charging Stations 2. Additive Manufacturing 3. Industrial Electronics 4. Organizational behavior	3	0	0	3
5	20EE7T30 20ME7T38 20EC7T41 20HM7T04	**Open Elective-IV** 1. Smart Grid Technologies 2. Sustainable Energy Technologies 3. Biomedical Instrumentation 4. Marketing Management	3	0	0	3
6	20HM7T11	Universal Human Values-II Understanding Harmony	3	0	0	3
7	20IT7S06 20CS7S07	**Skill Oriented Course - V** Deep Learning using Python/APSSDC offered Courses / MEAN Stack Technologies-MongoDB, Express.js, Angular JS Node.js, and AJAX	0	0	4	2
8	20CS7I02	Industrial/Research Internship 2 months (Mandatory) after third year (to be evaluated during VII semester	0	0	0	3
Total credits						**23**

Honors course 20CS7H05 Data Visualization	4	0	0	4
Minors course 20CS7M05 Database Management Systems$	3	0	2	4
20CS7H06 **Honors courses through SWAYAM**	0	0	0	2
20CS7M06 **Minors courses through SWAYAM**	0	0	0	2

$- Integrated Course

IV B. Tech –II Semester						
S.No	**Course Code**	**Course Title**	**Hours per week**			**Credits**
			L	**T**	**P**	**C**
1	20CS8P02	Major Project Work, Seminar, Internship	-	-	-	**8**
Total credits						**8**

Professional Communicative English

Common to CE, EEE, ME, ECE, CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Humanities and Social Sciences	**Course Code**	20HE1T01
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Emphasizes that the ultimate aim of Education is to enhance wisdom and inspires the readers to serve their nation with their self-enrichment.	K2
CO2	Enables the learners to promote peaceful co-existence and universal harmony in society and empowers them to initiate innovation.	K2
CO3	Imparts the students to manage different cultural shock due to globalization and develop multiculturalism to appreciate diverse cultures and motivate them to contribute to their nation.	K3
CO4	Arouses the thought of life to lead in the right path by recognizing the importance of work besides enhancing their LSRW skills.	K2
CO5	Inspires the learners at the advancement of software by the eminent personalities and motivates the readers to think and tap their innate talents.	K2

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	-	-	-	-	-	2	-	-	-	2	-	-	-	-	-
CO2	-	-	-	-	-	-	-	2	-	3	-	-	-	-	-
CO3	-	-	-	-	-	2	-	-	-	2	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-
CO5	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-

COURSE CONTENT	
UNIT I	1. _The Greatest Resource- Education' from Professional Communicative English. Objective: Schumacher describes the education system by saying that it was mere training, something more than knowledge of facts. Outcome: Underscores that the ultimate aim of Education is to enhance wisdom. 2. 'War' from _Panorama: A Course on Reading' Objective: To develop extensive reading skill and comprehension for pleasure andprofit. Outcome: Acquisition of LSRW skills
UNIT II	1. ' A Dilemma' from Professional Communicative English Objective: The lesson centres on the pros and cons of the development of science and technology. Outcome: Enables the students to promote peaceful co-existence and universal harmony among people in society. 2. 'The Verger' from _Panorama: A Course on Reading' Objective: To develop extensive reading skill and comprehension for pleasure andprofit. Outcome: Acquisition of LSRW skills
UNIT III	1. 'Cultural Shock': Adjustments to new Cultural Environments from Professional Communicative English. Objective: Depicts of the symptoms of Cultural Shock and the aftermath consequences Outcome: Enables the students to manage different cultural shocks due toglobalization. 2. 'The Scarecrow' from Panorama: A Course on Reading Objective: To develop extensive reading skill and comprehension for pleasure andprofit. Outcome: Acquisition of LSRW skills
UNIT IV	1. _The Secret of Work‘ from Professional Communicative English. Objective: Portrays the ways of living life in its real sense. Outcome: Arouses the thoughtto lead life in a right path by recognizing the importance of work. 2. 'A Village Lost to the Nation' from Panorama: A Course on Reading
	Objective: To develop extensive reading skill and comprehension for pleasure andprofit. Outcome: Acquisition of LSRW skills
UNIT V	1. *' The Chief Software Architect' from Professional Communicative English.* Objective: Supports the developments of technology for the betterment of humanlife. Outcome: Pupil gets inspired by eminent personalities who toiled for the present-day advancement of software development. 2. *'Martin Luther King and Africa' from Panorama: A Course on Reading* Objective: To develop extensive reading skill and comprehension for pleasure andprofit. Outcome: Acquisition of LSRW skills

TEXT BOOKS	
1.	**DETAILED TEXTBOOK:** • **PROFESSIONAL COMMUNICATIVE ENGLISH** *Published by Maruthi Publishers.*
2.	**NON-DETAILED TEXTBOOK:** • ***PANORAMA: A COURSE ON READING****, Published by Oxford University Press India* The course content, along with the study material, is divided into six units.

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Computer Science and Engineering

Differential Equations and Numerical Methods

Common to CE, EEE, ME, ECE, CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Basic Sciences	**Course Code**	20BM1T01
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Differentiation, Integration	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2	The skills derived from the course will help the student form a necessary base to develop analytic and design concepts.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Solve first order differential equations and its applications	K3
CO2	Solve the linear differential equations with constant coefficients by appropriate method	K3
CO3	Apply Newton, Gauss and Lagrange interpolation formulae to find interpolating polynomials for the given data.	K3
CO4	Find the approximate roots of transcendental equations by using different numerical methods	K2
CO5	Solve initial value problems by using different numerical schemes	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-

COURSE CONTENT	
UNIT I	**Differential equations of first order and first degree** Linear – Bernoulli – Exact – Reducible to exact. **Applications:** Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories.
UNIT II	**Linear differential equations of higher order** Non-homogeneous equations of higher order with constant coefficients with non- homogeneous form polynomials in $x^n, e^{ax}V(x), x^mV(x)$ - Method of Variation of parameters. $e^{ax},\ sin\ ax,\ cos\ ax$
UNIT III	**Interpolation** Introduction– Errors in polynomial interpolation – Finite differences – Forward differences– Backward differences –Central differences –properties – Differences of a polynomial- Newton's formulae for interpolation –Gauss formulae for interpolation- Interpolation with unequal intervals: Lagrange's interpolation formula.
UNIT IV	**Solution of Algebraic and Transcendental Equations** Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable).
UNIT V	**Solution of Ordinary Differential equations** Solution of ordinary differential equations by Taylor's series-Picard's method of successive approximations-Euler's method – Modified Euler's method - Runge-Kutta method (second and fourth order).

TEXT BOOKS	
1.	**B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	**Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
REFERENCE BOOKS	
1.	**Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
2.	**Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
3.	**Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
4.	**Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
5.	**T.K.V. Iyengar et. al.,** Engineering Mathematics Volume I & III S Chand Publications.
WEB RESOURCES	

1.	**UNIT I: Differential equations of first order and first degree** https://en.wikipedia.org/wiki/Differential_equation http://um.mendelu.cz/maw-html/index.php?lang=en&form=ode https://www.khanacademy.org/math/differential-equations/first-order-differential-equations
2.	**UNIT II: Linear differential equations of higher order** https://en.wikipedia.org/wiki/Differential_equation http://um.mendelu.cz/maw-html/index.php?lang=en&form=ode https://nptel.ac.in/courses/122107037/20
3.	**UNIT III: Interpolation** https://en.wikibooks.org/wiki/Introduction_to_Numerical_Methods/Interpolation
4.	**UNIT IV: Solution of Algebraic and Transcendental Equations** https://en.wikibooks.org/wiki/Numerical_Methods/Equation_Solving https://www.slideshare.net/100005232690054/algebraic-and-transcendental-equations
5.	**UNIT V: Solution of Ordinary Differential Equations** https://nptel.ac.in/courses/111107063/ https://www.facweb.iitkgp.ac.in/~rajas/cgen/page/nptlcrs

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Computer Science and Engineering

Applied Physics
Common to CE, EEE, ME, ECE, CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Basic Sciences	**Course Code**	20BP1T02
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Intermediate Physics	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required to design instruments with higher resolution.
2	Impart the knowledge of Lasers, Optical Fibers and their implications in optical communications.
3	To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in emerging micro devices.
4	To explain the concepts of Quantum Mechanics and free electron theories for study of metals and semiconductors.
5	Understand the formation of bands in Semiconductors and their working mechanism for their utility in Engineering applications

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Analyze the optical applications using the concepts of Interference and diffraction.	K4
CO2	Apply the basics of Laser Mechanism and fiber optics for the communications systems.	K3
CO3	Apply the basics of phenomenon related to dielectric materials and Magnetic Materials to study their dependence on temperature and frequency response.	K3
CO4	Understand the concepts of quantum mechanics for calculation of free quantum particle energies and phenomenon of electrical & thermal conductivities to sub microscopic particles.	K2
CO5	Understand the Band formation, electrical conductivities in semiconductors and study the types of semiconductors using Hall Effect.	K2

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	2	2	-	1	1	-	-	-	-	-	-	-	-	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	2	-	-	-

COURSE CONTENT	
UNIT I	**WAVEOPTICS** **INTERFERENCE** Introduction-Principle of Superposition – Coherent Sources – Interference in parallel thin film(reflection geometry)- Newton‘s rings, Determination of Wavelength and Refractive Index & Applications. **DIFFRACTION** Introduction-Types of diffraction-Fraunhoffer diffraction due to single slit, Double slit, NSlits (Qualitative)-Rayleigh criterion of resolution and Resolving power of grating (Qualitative).
UNIT II	**LASERS** Introduction-Characteristics–Spontaneous and Stimulated emission of radiation – population inversion - Pumping Schemes - Ruby laser – Helium Neon laser – Applications **FIBER OPTICS:** Introduction- Structure & Principle of Optical Fiber-Numerical Aperture and Acceptance Angle-classification of Optical fibers based on Refractive Index Profile and Modes- Block Diagram of optical fiber communication system- Advantages of Optical fibers- Applications.
UNIT III	**MAGNETICS PROPERTIES** Introduction-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials Dia,Para,Ferro,Antiiferro and Ferri Magnetic materials-Weiss Domain Theory(QualitativeTreatment)- Hysteresis-B-H Curve-soft and hard magnetic materials & applications **DIELECTRICS** Introduction - Dielectric polarization– Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations- Electronic Ionic and Orientation polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation -Applications of dielectrics.
UNIT IV	**QUANTUM MECHANICS** Introduction – Matter waves – de Broglie‘s hypothesis–Interpretation of wave function –
	Schrödinger Time Independent and Time Dependent wave equations – Particle in a potential box **FREE ELECTRON THEORY** Classical Free Electron Theory(Qualitative with discussions of merit and demerits)-Quantum Free Electron Theory-Equation of conductivity based on quantum free electron theory-Fermi Dirac Distribution-Density of States-Fermi Energy
UNIT V	**BANDTHEORYOFSOLIDS** Bloch‘s Theorem(Qualitative)-Kronig Penny Model(Qualitative)-E vs K diagram-V vs Kdiagram, Effective mass of electron-Classification of Crystalline Solids-Concept of hole **SEMICONDUCTOR PHYSICS** Introduction–Intrinsic Semi conductors - density of charge carriers- Electrical conductivity –Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers- Drift and Diffusion currents-Einstein‘s Equation -Hall effect - Applications of Hall effect

TEXT BOOKS	
1.	Engineering Physics by M.N.Avadhanalu,P.G.Kshirsagar & T V S Arun Murty,S Chand Pubication,11th Edition 2019
2.	–Engineering Physics‖ by M.R.Srinivasan, New Age international publishers
3.	Engineering Physics by P.K Palanisamy,Sci Tech Publication
REFERENCE BOOKS	
1.	Kettles Introduction to Solid state Physics-Charles Kittel,Wiley India Edition
2.	Solid State Physics ,AJ Dekker, I Edition,Macmillan Publishers India Private Limited
3.	–Solid State Physics‖ by SO Pilai., - New age International Publishers
4.	Engineering Physics by DK Bhattacharya and Poonam Tandon,Oxford Press(2018)
WEB RESOURCES	
1.	https://nptel.ac.in/courses/122/107/122107035/# https://nptel.ac.in/courses/122/107/122107035/#
2.	https://pragatiengg.org/pluginfile.php/29143/mod_folder/content/0/UNIT%20IV%20LASERS%20. pptx?forcedownload=1 https://nptel.ac.in/courses/104/104/104104085/ https://nptel.ac.in/courses/115/107/115107095/
3.	https://nptel.ac.in/courses/113/104/113104090/
	https://youtu.be/DDLljK1ODeg
4.	https://nptel.ac.in/courses/115/101/115101107/ https://nptel.ac.in/courses/115/105/115105122/
5.	https://www.electronics-tutorials.ws/diode/diode_1.html https://nptel.ac.in/courses/115/105/115105099/ https://nptel.ac.in/courses/108/108/108108122/

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Programming for Problem solving using C
Common to CE, EEE, ME, ECE, CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Engineering Sciences	**Course Code**	20CS1T01
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
2	To gain knowledge of the operators, selection, control statements and repetition in C
3	To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage.
4	To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
5	To assimilate about File I/O and significance of functions

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Apply the fundamentals of C Programming for Problem solving.	K3
CO2	Identify the appropriate Decision statement and Loops for a given Problem.	K2
CO3	Make use of Arrays and Strings to solve the problems in C.	K3
CO4	design and implement programs to analyze the different pointer applications	K3
CO5	Develop solutions for problems using Files and Functions.	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	3	3	3	1	-	-	-	-	-	-	-	1	1	-
CO2	3	3	3	3	1	-	-	-	-	-	-	-	1	1	-
CO3	3	3	3	2	1	-	-	-	-	-	-	-	2	1	-
CO4	2	3	3	3	1	-	-	-	-	-	-	-	2	2	-
CO5	3	3	3	3	1	-	-	-	-	-	-	-	2	2	-

COURSE CONTENT	
UNIT I	**Introduction to Computers**: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers **Introduction to the C Language:** Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and TypeQualifiers. **Structure of a C Program:** Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.
UNIT II	**Bitwise Operators**: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators. **Selection & Making Decisions**: Logical Data and Operators, Two Way Selection, MultiwaySelection, More Standard Functions. **Repetition:** Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.
UNIT III	**Arrays:** Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages **Strings:** String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.
UNIT IV	**Pointers:** Introduction, Pointers to pointers, Compatibility, L value and R value Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, MemoryAllocation Function, Array of Pointers, Programming Application. Processor Commands: Processor Commands.
UNIT V	**Functions:** Designing, Structured Programs, Function in C, User Defined Functions, Inter- Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion **Text Input / Output:** Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

TEXT BOOKS	
1.	Programming for Problem Solving, Beerhouse A. Forouzan, Richard F.Gilberg, CENGAGE.
2.	The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson.
REFERENCE BOOKS	
1.	Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
2.	Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
3.	Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD.
WEB RESOURCES	
1.	http://nptel.ac.in/courses/106104128/
2.	http://students.iitk.ac.in/programmingclub/course/#notes
3.	http://c-faq.com/~scs/cclass/cclass.html
4.	http://www.youtube.com/watch?v=b00HsZvg-V0&feature=relmfu
5.	http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical-programming-in-c-january-iap-2010/

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Computer Engineering Workshop
Common to CSE, CSE(AI&ML), CSE(AI), CSE(DS), IT

Course Category	Engineering Sciences	**Course Code**	20IT1L01
Course Type	Laboratory	**L-T-P-C**	1-0-4-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	PC Hardware: Identification of basic peripherals, Assembling a PC, Installation of system software like MS Windows, device drivers, etc. Troubleshooting of PC Hardware and Software issues.
2	Internet & World Wide Web: Different ways of hooking the PC on to the internet from homeand workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene (protecting the personal computer from getting infected with the viruses), worms and other cyber attacks.
3	Productivity Tools: Understanding and practical approach of professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suiteoffice tools.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**BTL**
CO1	Identify, assemble and update the components of a computer	K2
CO2	Configure, evaluate and select hardware platforms for the implementation and execution of computer applications, services and systems	K3
CO3	Make use of tools for converting pdf to word and vice versa	K2
CO4	Develop presentation, documents and small applications using productivity tools such as word processor, presentation tools, spreadsheets, HTML, LaTex	K3

*k1- Remembering, k2- Understanding, k3- Applying, k4- Analyzing, k5- Evaluating, k6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes(1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	2	1	-	-	-	-	-	-	-	-	-	1	1
CO2	3	2	2	1	-	-	-	-	-	-	-	-	-	1	2
CO3	2	2	2	1	2	-	-	-	-	-	-	-	-	1	1
CO4	2	2	2	1	2	-	-	-	-	-	-	-	1	2	2

COURSE CONTENT	
Task1	Identification of the peripherals of a computer - Prepare a report containing the block diagram of the computer along with the configuration of each component and its functionality. Describe about various I/O Devices and its usage.
Task2	Practicing disassembling and assembling components of a PC
Task3	Installation of Device Drivers, MS Windows, Linux Operating systems and Disk Partitioning, dual boating with Windows and Linux
Task4	Introduction to Memory and Storage Devices, I/O Port, Assemblers, Compilers, Interpreters, Linkers and Loaders.

Task5	Demonstration of Hardware and Software Troubleshooting
Task6	Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC, Bluetooth Technology, Wireless Technology, Modem, DSL, and Dialup Connection.
Task7	Surfing the Web using Web Browsers, Awareness of various threats on the Internet and its solutions, Search engines and usage of various search engines, Need of anti-virus, Installation of anti-virus, configuring personal firewall and windows update. (Students should get connected to their Local Area Network and access the Internet. In the process they should configure the TCP/IPsetting and demonstrate how to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and pop up blockers)
Productivity Tools	
Task8	Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage, Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list. Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages,etc.,
Task9	Demonstration and Practice of various features of Microsoft Word Assignment: 1. Create a project certificate. 2. Creating a news letter Features to be covered:-Formatting Fonts, Paragraphs, Text effects, Spacing, Borders and Colors, Header and Footer, Date and Time option, tables, Images, Bullets and Numbering, Table of Content, Newspaper columns, Drawing toolbar and Word Art and Mail Merge in word etc.,
Task10	Demonstration and Practice of various features Microsoft Excel Assignment: 1. Creating a scheduler 2. Calculating GPA 3. Calculating Total, average of marks in various subjects and ranks of students based on marks Features to be covered:- Format Cells, Summation, auto fill, Formatting Text, Cell Referencing, Formulae in excel, Charts, Renaming and Inserting worksheets, etc.,
Task11	Demonstration and Practice of various features Microsoft Power Point Features to be covered:- Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks Tables and Charts, Master Layouts, Types of views, Inserting – Background, textures, Design Templates, etc.,
Task12	Demonstration and Practice of various features LaTeX – document preparation, presentation (Features covered in Task 9 and Task 11 need to be explored in LaTex)
Task13	Tools for converting word to pdf and pdf to word
Task14	Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices

Note: Faculty to consolidate the workshop manuals using the textbook and references

REFERENCE BOOKS	
1	Computer Fundamentals, Anita Goel, Pearson India Education, 2017
2	PC Hardware Trouble Shooting Made Easy, TMH
3	Introduction to Information Technology, ITL Education Solutions Limited, 2nd Edition, Perason, 2020
4	Upgrading and Repairing PCs, 18th Edition, Scott Mueller, QUE, Pearson, 2008
5	LaTeX Companion – Leslie Lamport, PHI/Pearson
6	Introducing HTML5, Bruce Lawson, Remy Sharp, 2nd Edition, Pearson, 2012
7	Teach yourself HTML in 24 hours, By Techmedia
8	HTML 5 and CSS 3.0 to the Real World by Alexis Goldstein, Sitepoint publication
9	Internet of Things, Technologies, Applications, Challenges and Solutions, B K Tripathy, J Anuradha, CRC Press
10	Comdex Information Technology Course Tool Kit, Vikas Gupta, Wiley Dreamtech
11	IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme, CISCO Press, Pearson Education
12	Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N.B. Venkateswarlu, S. Chand Publishers

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Professional Communicative English Laboratory

Common to CE, EEE, ME, ECE, CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Humanities and Social Sciences	**Course Code**	20HE1L01
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understand different speech sounds and maintain proper pronunciation and rhythm in day to day conversations.	K2
CO2	Interpret and respond appropriately in various day to day contexts and improves technics in group discussions.	K5
CO3	Develop the required communication skills to deliver effective presentations and interviews with clarity and impact.	K6

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-

COURSE CONTENT	
UNIT I	Introduction, Consonant Sounds, Vowel Sounds
UNIT II	Rhythm and Pronunciation , Weak/strong and contrasted forms, Practice of Rhythm
UNIT III	Dialogues
UNIT IV	Group Discussions
UNIT V	Presentations & Public Speaking
UNIT VI	Interviews

PRESCRIBED LAB MANUAL FOR SEMESTER I:
_**STRENGTHEN YOUR STEPS**: A Multimodal Course in Communication Skills'Published by Maruthi Publications.
OBJECTIVES: To enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.

OUTCOME: A study of the communicative items in the laboratory will help the studentsbecome successful in the competitive world.

The course content, along with the study material, is divided into six units.

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Applied Physics Laboratory

Common to CE, EEE, ME, ECE, CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Basic Sciences	**Course Code**	20BP1L02
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Intermediate Physics	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	The student will have exposure to experimental skills which is essential for an Engineering student.
2	To gain practical knowledge by applying the experimental results and correlate with the theoretical principles.
3	Apply the Analytical techniques and graphical analysis to the experimental data

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the basics of Interference, Diffraction in Physics using instruments like Spectrometer, Travelling microscope.	K2
CO2	Determine the Magnetic and Dielectric constants of materials.	K3
CO3	Apply the basics of Current Electricity and Semiconductors in engineering application	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-

COURSE CONTENT
(Any 10 of the following listed 15 experiments):
8 Regular mode and any two experiments in Virtual mode(Virtual Lab)

1.	Determination of wavelength of laser Light using diffraction grating.
2.	Determination of wavelength of a light using Diffraction Grating-Normal incidence.
3.	Newton‘s rings – Determination of Radius of Curvature of Plano - Convex Lens.
4.	Determination of thickness of a spacer using wedge film and parallel interference fringes.
5.	Magnetic field along the axis of a current carrying coil – Stewart and Gee‘s apparatus.
6.	Energy Band gap of a Semiconductor p - n junction.
7.	Characteristics of Thermistor – Temperature Coefficients
8.	Determination of dielectric constant by charging and discharging method
9.	Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10.	Determination of Dispersive power of diffraction grating.
11.	To Study the V-I Characteristics and determine the breakdown voltage of a Zener Diode
12.	Determination of Hall Voltage and Hall coefficients of a given semiconductor using Hall effect.
13.	Determination of Acceleration due to gravity and Radius of gyration Using Compound Pendulum.
14.	Determination of Numerical Aperture and acceptance angle of an Optical Fiber
15.	Estimation of Planck‘s Constant using Photoelectric Effect.

TEXT BOOKS	
1.	College customized manual
WEB RESOURCES	
1.	www.vlab.co.in (virtual lab link)

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Programming for Problem solving using C Laboratory
Common to CE, EEE, ME, ECE, CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Engineering Sciences	**Course Code**	20CS1L01
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	Apply the principles of C language in problem solving.
2	To design flowcharts, algorithms and knowing how to debug programs.
3	To design & develop of C programs using arrays, strings pointers & functions.
4	To review the file operations, preprocessor commands.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Knowledge on various concepts of a C language.	K3
CO2	Draw flowcharts and write algorithms.	K3
CO3	Design and development of C problem solving skills.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	1	-	-	-	-	-	-	-	2	2	-
CO2	3	3	3	3	1	-	-	-	-	-	-	-	2	2	-
CO3	3	3	3	3	1	-	-	-	-	-	-	-	2	2	-

COURSE CONTENT	
1.	**Exercise 1:** 1. Write a C program to print a block F using hash (#), where the F has a height of sixcharacters and width of five and four characters. 2. Write a C program to compute the perimeter and area of a rectangle with a height of7 inches and width of 5 inches.
	3. Write a C program to display multiple variables.
2.	**Exercise 2:** 1. Write a C program to calculate the distance between the two points. 2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of rand s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".
3.	**Exercise 3:** 1. Write a C program to convert a string to a long integer. 2. Write a program in C which is a Menu-Driven Program to compute the area of thevarious geometrical shape. 3. Write a C program to calculate the factorial of a given number.
4.	**Exercise 4:** 1. Write a program in C to display the n terms of even natural number and their sum. 2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms. 3. Write a C program to check whether a given number is an Armstrong number or not.
5.	**Exercise 5:** 1. Write a program in C to print all unique elements in an array. 2. Write a program in C to separate odd and even integers in separate arrays. 3. Write a program in C to sort elements of array in ascending order.
6.	**Exercise 6:** 1. Write a program in C for multiplication of two square Matrices. 2. Write a program in C to find transpose of a given matrix.
7.	**Exercise 7:** 1. Write a program in C to search an element in a row wise and column wise sortedmatrix. 2. Write a program in C to print individual characters of string in reverse order.
8.	**Exercise 8:** 1. Write a program in C to compare two strings without using string library functions. 2. Write a program in C to copy one string to another string.
9.	**Exercise 9:** 1. Write a C Program to Store Information Using Structures with Dynamically MemoryAllocation 2. Write a program in C to demonstrate how to handle the pointers in the program.
10.	**Exercise 10:** 1. Write a program in C to demonstrate the use of & (address of) and *(value ataddress) operator. 2.Write a program in C to add two numbers using pointers
11.	**Exercise 11:** 1. Write a program in C to add numbers using call by reference. 2. Write a program in C to find the largest element using Dynamic MemoryAllocation.
12.	**Exercise 12:** 1. Write a program in C to swap elements using call by reference. 2. Write a program in C to count the number of vowels and consonants in a string using apointer.
13.	**Exercise 13:** 1.Write a program in C to show how a function returning pointer. 2. Write a C program to find sum of n elements entered by user. To perform thisprogram, allocate memory dynamically using malloc( ) function.
14.	**Exercise 14:** 1.Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs 2. Write a program in C to convert decimal number to binary number using the function.
15.	**Exercise 15:** 1. Write a program in C to check whether a number is a prime number or notusing the function. 2. Write a program in C to get the largest element of an array using the function.
16.	**Exercise 16:** 1. Write a program in C to append multiple lines at the end of a text file. 2. Write a program in C to copy a file in another name. 3. Write a program in C to remove a file from the disk.

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Linear Algebra and Partial Differential Equations

Common to CE, EEE, ME, ECE, CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Basic Sciences	**Course Code**	20BM2T02
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Basics of Matrices, Differentiation, Integration	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2	The skills derived from the course will help the student form a necessary base to develop analytic and design concepts.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Solve systems of linear equations, determine the rank, find the eigenvalues and eigenvectors, diagonalization of a matrix.	K3
CO2	Identify special properties of a matrix, such as positive definite, etc.,and use this information to facilitate the calculation of matrix characteristics.	K2
CO3	Find areas and volumes using double and triple integrals	K2
CO4	Find partial derivatives of multivariable functions and apply them to find extreme values of a function.	K3
CO5	Apply a range of techniques to find solutions of standard PDEs	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-

COURSE CONTENT	
UNIT I	**Solving system of linear equations, Eigen Values and Eigen vectors** Rank of a matrix by echelon form and normal form – Solving system of homogeneous andnon-homogeneous linear equations – Gauss elimination method, Gauss Jacobi and Gauss Seidel for solving system of equations – Eigenvalues and Eigen vectors and their properties.
UNIT II	**Cayley-Hamilton Theorem and Quadratic forms** Cayley-Hamilton theorem (without proof) – Finding inverse and powers of a matrix by Cayley-Hamilton theorem – Quadratic forms-Reduction to canonical form by congruent transformations-nature of the quadratic form - reduction of quadratic form to canonical form by orthogonal transformation.
UNIT III	**Multiple integrals** Multiple integrals: Double and triple integrals – Change of variables -Polar coordinates - Cylindrical coordinates– Change of order of integration. **Applications:** Finding Areas and Volumes.
UNIT IV	**Partial differentiation** Introduction – Homogeneous function – Euler‘s theorem – Total derivative – Chain rule – Generalized Mean value theorem for single variable (without proof) – Taylor‘s and Maclaurin‘s series expansion of functions of two variables – Jacobian – Functional dependence. **Applications:** Maxima and Minima of functions of two variables without constraints and Lagrange‘s method (with constraints).
UNIT V	**Partial Differential Equations and Applications** Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations. **Applications:** One dimensional wave and heat equations.

TEXT BOOKS	
1.	**B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	**Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
REFERENCE BOOKS	
1.	**Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
2.	**Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
3.	**Peter O’neil**, Advanced Engineering Mathematics, Cengage Learning.
4.	**Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
5.	**T.K.V. Iyengar et. al.,** Engineering Mathematics Volume I & III S Chand Publications.
6.	**T. Amarnath,** An Elementary Course in Partial Differential Equations, Narosa Publications
WEB RESOURCES	
1.	**UNIT I: Solving system of linear equations, Eigen Values and Eigen vectors** https://en.wikipedia.org/wiki/System_of_linear_equations https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
2.	**UNIT II: Cayley-Hamilton Theorem and Quadratic forms** https://www.math.hmc.edu/calculus/tutorials/eigenstuff/https://en.wikipedia.org/wiki/Quadratic_form
3.	**UNIT III: Multiple Integrals** https://en.wikipedia.org/wiki/Multiple_integral http://tutorial.math.lamar.edu/Classes/CalcIII/MultipleIntegralsIntro.aspx
4.	**UNIT IV: Partial Differentiation** https://en.wikipedia.org/wiki/Partial_derivative https://www.whitman.edu/mathematics/calculus_online/section14.03.html
5.	**UNIT V:Partial Differential Equations and Applications** https://en.wikipedia.org/wiki/Partial_differential_equation

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Applied Chemistry

Common to CE, EEE, ME, ECE, CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Basic Sciences	**Course Code**	20BC2T02
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Intermediate Chemistry	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn about Electrochemical cells, Batteries and Fuel cells
2	To learn about non conventional energy sources
3	To study about Nano materials, Super conductors and their preparation, applications and also about principles of green chemistry and green engineering applications
4	To know about Polymers, Plastics and Elastomers
5	To Understand the principles of different analytical instruments and their applications

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	To compare different types of batteries and explain the merits of fuel cell.	K2
CO2	List out different renewable sources of energy.	K3
CO3	To explain the Green methods of Synthesis and applications of Green technologies and also Band theory applications.	K3
CO4	Analyze the importance of Polymers in engineering applications.	K2
CO5	To Distinguish between Rotaxane and Catenane molecular machines	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	1	2	2	2	-	2	-	-	-	2	-	1	-	**1**
CO2	2	2	1	-	-	1	1	-	-	-	1	-	-	-	-
CO3	1	1	-	1	2	-	-	-	-	-	-	1	-	**1**	-
CO4	2	2	-	1	-	-	1	-	-	-	-	1	-	-	-
CO5	**1**	1	1	-	-	-	1	-	-	-	2	1	1	-	-

COURSE CONTENT	
UNIT I	**ELECTROCHEMICAL ENERGY SYSTEMS** Electrode Potential, Nernst Equation, EMF of the cell, Types of Electrodes - Hydrogen and Calomel Electrode, Electrochemical Cell, Galvanic Cell vs Electrolytic Cell, Concentration Cells, Types of Ion Selective Electrodes- Glass Membrane Electro Batteries- Characteristics, Classification and Important Applications. Classical batteries- Dry/Lechlanche cell, Modern batteries- Zinc air, Lithium cells : Li -MnO2 cell. Fuel cells- Introduction, H2-O2 fuel cell, Advantages of fuel cells.
UNIT II	**ENERGY SOURCES AND APPLICATIONS** Introduction- Sources of renewable energy **Solar energy** – Introduction- Photo voltaic cell/ Solar cell – Construction and Working,

	Applications of Solar energy. Photo Galvanic Cells, Electrochemical Sensors. **Non Conventional Energy Sources:** Hydropower, Geo Thermal Power, Tidal Power, Ocean Thermal Energy Conversion (OTEC).
UNIT III	**MATERIAL SCIENCE AND ENGINEERING** **III-A: Nanomaterials:** Introduction , Preparation of Carbon Nano Tubes(CNTs) byArc discharge and Chemical Vapor Deposition Methods. Fullerenes : Preparation, Properties and Applications; Chemical Synthesis of Nanomaterials : Sol-gel method, Applications of Nano Materials in Wastewater treatment and Medicine. **III-B: Green Chemistry:** Introduction, Principles of Green Chemistry and EngineeringApplications with a ***case study*** **Band Theory of Solids:** Introduction –Explanation of Conductors, Semiconductors and Insulators by Band Theory. Super conductors: Types-Preparation, Properties and Applications**.**
UNIT IV	**POLYMER CHEMISTRY** **Polymers**: Introduction, Functionality of monomers, Chain (Addition) Polymerization, Step(Condensation) Polymerization, Co-Ordination Polymerization, Co - Polymerization with examples and Mechanism. Conducting polymers : Mechanism of Conduction in Poly acetylene, Poly aniline and their Applications. **Plastics**: Thermoplastics and Thermo Setting resins; Preparation, Properties and Applications of Bakelite, Urea- formaldehyde Resin, Nylon – 6,6. **Elastomers**: ***Vulcanization of rubber***, Preparation, Properties and Applications of Buna-S and Buna – N.
UNIT V	**Instrumental Methods & Molecular Machines and Switches** A) Spectroscopic Techniques: Electromagnetic Spectrum- Introduction, Absorption of radiation: Beer-Lambert's law. Principles of UV-Visible and IR Spectroscopic techniques andtheir Applications. B) Molecular Machines: Rotaxanes and Catenanes as artificial Molecular Machines. Molecular Switches: Introduction, Cyclodextrin based Switches.

TEXT BOOKS	
1.	P.C. Jain and M. Jain, Engineering Chemistry, 15/e, Dhanapat Rai & Sons, Delhi (2014).
2.	Engineering Chemistry by Shikha Agarwal: Cambridge University Press,2019 edition .
REFERENCE BOOKS	
1.	Sashi Chawla, A Textbook of Engineering Chemistry, Dhanapath Rai and sons, (2003)
2.	S.S. Dara, A Textbook of Engineering Chemistry, S.Chand& Co, (2010)
3.	N. Krishna Murthy and Anuradha, A text book of Engineering Chemistry, Murthy Publications (2014)
WEB RESOURCES	
1.	**Electrochemical Energy systems** https://en.wikipedia.org/wiki/Electrochemical_cell
2.	**Energy Sources and Applications** https://en.wikipedia.org/wiki/Hydropower
3.	**Material Science and Engineering** https://en.wikipedia.org/wiki/Nanomaterials
4.	**Polymer Chemistry** https://en.wikipedia.org/wiki/Polymer_chemistry
5.	**Instrumental Methods & Molecular Machines and Switches** https://en.wikipedia.org/wiki/Spectroscopy

Computer Organization
Common to CSE, IT

Course Category	Engineering Sciences	**Course Code**	20EC2T02
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
2	The depth in understanding of basic organization, design, programming of a simple digital computer.
3	The concepts of computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understanding the design of the functional units of a digital computer system. Relate Postulates of Boolean algebra and minimize combinational functions.	K2
CO2	Design and analyze sequential circuits and Identify, compare and assess issues related to ISA, memory, control and I/O functions.	K4
CO3	Understand the basic concepts of computer arithmetic, organization and design	K2
CO4	Understand the programming concepts of control unit, CPU and 8086 microprocessors.	K2
CO5	Recall the internal organization of computers, memory unit and Input/Outputs and the relations between its main components	K2

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	1	1	-	-	-	-	-	-	1	-	-	-	-	3
CO2	1	2	2	-	-	-	-	-	-	1	-	-	1	-	1
CO3	2	1	2	-	-	-	-	-	-	1	-	-	-	2	2
CO4	2	3	2	-	-	-	-	-	-	1	-	-	2	-	2
CO5	1	2	1	-	-	-	-	-	-	-	-	-	-	1	1

COURSE CONTENT	
UNIT I	**Digital Components and Data Representation**: Introduction, Numbering Systems, Decimal to Binary Conversion, Binary Coded Decimal Numbers, Weighted Codes, Self- Complementing Codes, Cyclic Codes, Error Detecting Codes, Error Correcting Codes, Hamming Code for Error Correction, Alphanumeric Codes, ASCII Code **Data Representation:** Data types, Complements, Fixed Point Representation, Floating Point Representation.

	Combinational Circuits: Boolean expressions and their minimization using algebraic identities; Karnaugh map representation and minimization of Boolean functions using Kmap; Two-level realizations using gates -- AND-OR, OR-AND, NAND-NAND and NOR-NOR structures
UNIT II	**Digital logic circuits**: Combinatorial Circuits: Introduction, Combinatorial Circuit Design Procedure, Integrated NAND-NOR Gates, Multifunction gates, Multi-bit adder, Multiplexers, De-multiplexers, Decoders **Sequential Switching Circuits**: Latches and Flip-Flops, Ripple counters using T flipflops; Synchronous counters; Shift Registers; Ring counters
UNIT III	**Computer Arithmetic:** Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations. **Basic Computer Organization and Design:** Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.
UNIT IV	**Micro programmed Control:** Control memory, Address sequencing, micro programexample, design of control unit. **Central Processing Unit:** General Register Organization, Instruction Formats, Addressingmodes, Data Transfer and Manipulation, Program Control. **8086 microprocessor:** pin diagram, instruction set, Introduction to assembly language programming, Assembler, linker, Locator, debugger, emulator concepts. Assembler directives, 8086 programming examples to implement while - do, Repeat - Until, if-thenelse
	constructs etc, String operations, Array, far and near procedures, macros. Timing and delay loops
UNIT V	**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory. **Input-Output Organization:** Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

TEXT BOOKS	
1.	Digital Logic and Computer Design, Moriss Mano, 11th Edition, Pearson Education.
2.	Computer System Architecture, 3rded., M.MorrisMano, PHI
3.	Microprocessor and Interfacing –Douglas V. Hall, 3 rd edition, TMH
REFERENCE BOOKS	
1.	Digital Logic and Computer Organization, Rajaraman, Radhakrishnan, PHI, 2006.
2.	Computer Organization, 5thed., Hamacher, Vranesic and Zaky, TMH, 2002.
3.	Computer Organization & Architecture: Designing for Performance, 7thed., William Stallings, PHI, 2006.

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Python Programming
Common to CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Engineering Sciences	**Course Code**	20CS2T03
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal** **Assessment Semester** **End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn about Python programming language syntax, semantics, and the runtime environment.
2	To be familiarized with universal computer programming concepts like data types, containers.
3	To be familiarized with general computer programming concepts like conditional execution, loops & functions.
4	To be familiarized with general coding techniques and object-oriented programming

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Develop essential programming skills in computer programming concepts like data types, containers.	K3
CO2	Apply the basics of programming in the Python language.	K3
CO3	Solve coding tasks related conditional execution, loops.	K3
CO4	Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming.	K3
CO5	Make use of Exceptions and GUI interfaces for developing applications	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	3	2
CO2	3	2	1	1	1	-	-	-	-	-	-	1	3	3	2
CO3	3	2	1	1	1	-	-	-	-	-	-	1	3	3	2
CO4	3	2	2	3	3	-	-	-	-	-	-	1	3	3	2
CO5	3	2	2	3	3	-	-	-	-	-	-	1	3	3	2

COURSE CONTENT	
UNIT I	Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output. Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.
UNIT II	Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and ifelse Statement, Conditional Iteration The While Loop Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.
UNIT III	List and Dictionaries: Lists, Defining Simple Functions, Dictionaries Design with Function**:** Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program‘s Namespace, Higher Order Function. Modules: Modules, Standard Modules, Packages.
UNIT IV	File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations Object Oriented Programming**:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM,
	Structuring Classes with Inheritance and Polymorphism.
UNIT V	Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions,User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions. Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources. Programming**:** Introduction to Programming Concepts with Scratch.

TEXT BOOKS	
1.	Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2.	Python Programming: A Modern Approach, VamsiKurama, Pearson.
REFERENCE BOOKS	
1.	Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
2.	Introduction to Programming Using Python, Y. Daniel Liang, Pearson.
WEB RESOURCES	
1.	https://www.tutorialspoint.com/python3/python_tutorial.pdf

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Data Structures

Common to CE, EEE, ME, ECE, CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Engineering Sciences	**Course Code**	20IT2T01
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Exposure to Programming for Problem Solving using C	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Introduce the fundamental concept of data structures and abstract data types
2	Emphasize the importance of data structures in developing and implementing efficient algorithms
3	Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Summarize the properties, interfaces, and behaviors of basic abstract data types	K2
CO2	Discuss the computational efficiency of the principal algorithms for sorting & searching	K2
CO3	Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs	K3
CO4	Demonstrate different methods for traversing trees	K2
CO5	Implement algorithms on Graphs	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	-	-	-	-	-	-	2	1	-
CO2	2	3	1	1	1	-	-	-	-	-	-	-	1	1	1
CO3	2	3	1	2	1	-	-	-	-	-	-	-	1	1	1
CO4	2	3	1	1	1	-	-	-	-	-	-	-	1	1	1
CO5	3	3	1	1	1	-	-	-	-	-	-	-	1	1	1

COURSE CONTENT	
UNIT I	**Data Structures** - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity. Searching - Linear search, Binary search, Fibonacci search. **Sorting**- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.
UNIT II	**Linked List:** Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation, Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.
UNIT III	**Queues:** Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues- Circular Queues, Deques, Priority Queues, Multiple Queues. **Stacks:** Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.
UNIT IV	**Trees:** Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.
UNIT V	**Graphs:** Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra‘s shortest path, Transitive closure, Warshall‘s Algorithm.

TEXT BOOKS	
1.	Data Structures Using C. 2nd Edition.Reema Thareja, Oxford.
2.	Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.
REFERENCE BOOKS	
1.	Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2.	Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3.	Data Structures with C, Seymour Lipschutz TMH
WEB RESOURCES	
1.	http://algs4.cs.princeton.edu/home/
2.	https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Applied Chemistry Laboratory

Common to CE, EEE, ME, ECE, CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Basic Sciences	**Course Code**	20BC2L02
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Basic Chemistry	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Estimate the given amount of dissolved compounds in a solution byusing volumetric analysis and preparation of polymers and nano particles	K3
CO2	Determine the concentration of different metal ions present in water by complexometric titrations.	K2
CO3	Evaluate the accurate value of P^H and conductivity of given solutions and to estimate the viscosity and surface tension of given solutions.	K5

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O1**	**PS O2**	**PS O3**
CO1	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	1	-	-	-	-	-	-	-	-	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-

COURSE CONTENT

Any 10 of the following listed 13 experiments

Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions,Volumetric titrations, Quantitative analysis

1.	Estimation of HCI using standard Na_2CO_3 solutions
2.	Determination of alkalinity of a sample containing Na_2CO_3 and NaOH
3.	Estimation of $KmnO_4$ using standard Oxalic acid solution
4.	Estimation of Ferrous iron using standard $K_2Cr_2O_7$ solution
5.	Determination of Temporary and permanent Hardness of water using standard EDTA solution
6.	Determination of % moisture content in a coal sample
7.	Determination of Mg^{2+} present in an antacid
8.	Estimation of HCl using standard NaOH Solution by Conductometric titration
9.	Estimation of Vitamin – C
10.	Preparation of Phenol – Formaldehyde Resin
11.	Determination of viscosity of a liquid
12.	Determination of surface tension of a liquid
13.	Preparation of Nano particles.(Cu/Zn)

TEXT BOOKS	
1.	Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel‘s Quantitative Chemical Analysis 6/e, Pearson publishers (2000)
2.	N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat Rai Publishing Company (2007)
REFERENCE BOOKS	
1.	Vogel‘s Textbook of Quantitative chemical analysis, J. Mendham et.al.
2.	College designed manual
WEB RESOURCES	
1.	www.bsauniv.ac.in/UploadImages/Downloads/Estimation%20of%20Hardness
2.	https://pubs.acs.org/doi/abs/10.1021/i560133a023

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Python Programming Laboratory
Common to CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Engineering Sciences	**Course Code**	20CS2L03
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To acquire programming skills in core Python and to acquire Object Oriented Skills in Python
2	To develop the skill of designing Graphical user Interfaces in Python
3	To develop the ability to write database applications in Python

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Write, Test and Debug Python Programs and Use Conditionals and Loopsfor Python Programs	K4
CO2	Use functions and represent Compound data using Lists, Tuples and Dictionaries	K3
CO3	Use various applications using python	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	-	-	-	-	-	-	2	3	3	2
CO2	3	2	1	1	1	-	-	-	-	-	-	2	3	3	2
CO3	3	2	1	1	1	-	-	-	-	-	-	2	3	3	2

COURSE CONTENT

1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
4) Write a program that asks the user for their name and how many times to print it.The program should print out the user's name the specified number of times.
5) Use a *for*loop to print a triangle like the one below. Allow the user to specify howhigh the triangle should be.

```
*
**
***
****
```

6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7) Write a program that asks the user for two numbers and prints *Close* if the numbersare within .001 of each other and Not close otherwise.
8) Write a program that asks the user to enter a word and prints out whether that wordcontains any vowels.
9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde*and*ABCDE* the program should print out *AaBbCcDdEe*.
10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.
11) In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
12) Write a program that generates a list of 20 random numbers between 1 and 100.
    (a) Print the list.
    (b) Print the average of the elements in the list.
    (c) Print the largest and smallest values in the list.
    (d) Print the second largest and second smallest entries in the list
    (e) Print how many even numbers are in the list.
13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.
15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].
16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements,it is much shorter with lists and it is also easier to add new conversions if you use lists.

17) Write a function called *sum_digits*that is given an integer num and returns the sum of the digits of num.
18) Write a function called *first_diff*that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
19) Write a function called *number_of_factors*that takes an integer and returns howmany factors the number has.
20) Write a function called *is_sorted*that is given a list and returns True if the list issorted and False otherwise.
21) Write a function called root that is given a number x and an integer n and returns$x^{1/n}$. In the function definition, set the default value of n to 2.
22) Write a function called primes that is given a number n and returns a list of the firstn primes. Let the default value of n be 100.
23) Write a function called merge that takes two already sorted lists of possiblydifferent lengths, and merges them into a single sorted list.
    (a) Do this using the sort method. (b) Do this without using the sort method.
24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can‘t exceed the number of occurrences of the letter in the user‘s word.
25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file calledftemps.txt.
27) Write a class called Product. The class should have fields called name, amount, and price, holding the product‘s name, the number of items of that product in stock,and the regular price of the product. There should be a method *get_price*that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase*that receives the number of items to be bought and decreases amount by that much.
28) Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes*that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours*that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
29) Write a class called Converter. The user will pass a length and a unit whendeclaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.
30) Write a Python class to implement pow(x, n).
31) Write a Python class to reverse a string word by word.
32) Write a program that opens a file dialog that allows you to select a text file. Theprogram then displays the contents of the file in a textbox.
33) Write a program to demonstrate Try/except/else.
34) Write a program to demonstrate try/finally and with/as.

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Computer Science and Engineering

Data Structures Laboratory
Common to CSE, CSE(AI&ML), CSE(AI), CSE(DS), IT

Course Category	Engineering Sciences	**Course Code**	20IT2L02
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Programming for Problem Solving using C	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	Demonstrate the different data structures implementation.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Use basic data structures such as arrays and linked list.	K3
CO2	Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.	K2
CO3	Use various searching and sorting algorithms.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	-	-	-	-	-	-	2	1	-
CO2	2	3	1	2	1	-	-	-	-	-	-	-	1	1	1
CO3	2	3	1	1	1	-	-	-	-	-	-	-	1	1	1

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

COURSE CONTENT	
Exercise -1 (Searching)	a) Write C program that use both recursive and non recursive functions to perform Linearsearch for a Key value in a given list. b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.
Exercise -2 (Sorting-I)	a) Write C program that implement Bubble sort, to sort a given list of integers in ascendingorder b) Write C program that implement Quick sort, to sort a given list of integers in ascendingorder c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order
Exercise -3 (Sorting-II)	a) Write C program that implement radix sort, to sort a given list of integers in ascendingorder b) Write C program that implement merge sort, to sort a given list of integers in ascending order
Exercise -4 (Singly Linked List)	a) Write a C program that uses functions to create a singly linked list b) Write a C program that uses functions to perform insertion operation on a singly linkedlist c) Write a C program that uses functions to perform deletion operation on a singly linked list d) Write a C program to reverse elements of a single linked list.
Exercise -5 (Queue)	a) Write C program that implement Queue (its operations) using arrays. b) Write C program that implement Queue (its operations) using linked lists
Exercise -6 (Stack)	a) Write C program that implement stack (its operations) using arrays b) Write C program that implement stack (its operations) using Linked list c) Write a C program that uses Stack operations to evaluate postfix expression
Exercise -7 (Binary Tree)	Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.
Exercise -8 (Binary Search Tree)	a) Write a C program to Create a BST b) Write a C program to insert a node into a BST. c) Write a C program to delete a node from a BST.

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Computer Science and Engineering

Environmental Science
Common to CE, ME, ECE, CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Mandatory Course	**Course Code**	20BE2T01
Course Type	Theory	**L-T-P-C**	2-0-0-0
Prerequisites	Basic Knowledge in Environment and protection.	**Internal Assessment** **Semester End Examination** **Total Marks**	0 0 0

COURSE OBJECTIVES	
1	To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.	K2
CO2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities	K2
CO3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century	K2
CO4	Recognize the interconnectedness of human dependence on the earth's ecosystems	K2
CO5	Influence their society in proper utilization of goods and services.	K2

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O1**	**PS O2**	**PS O3**
CO1	1	-	1	-	-	1	2	-	-	-	1	-	-	-	-
CO2	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-
CO3	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-
CO4	-	-	-	-	1	1	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	3	1	-	-	-	-	-	-	-

COURSE CONTENT	
UNIT I	**Multidisciplinary nature of Environmental Studies** Definition, Scope and Importance-International Efforts & Indian Environmentalists **Natural Resources** Forest resources : deforestation – Mining, dams and other effects on forest and tribal people.Water resources :Use and over utilization of surface and groundwater. Food resources: World food problems, effects of modern agriculture, fertilizer-pesticideproblems. Energy resources: renewable and nonrenewable energy sources. Role of an individual in conservation of natural resources.Equitable use of resources forsustainable lifestyles.
UNIT II	**Ecosystems, Biodiversity and its conservation** Definition of Ecosystem and its structure, Functions Biodiversity Definition-Value of biodiversity, India as a mega-diversity nation, Threats tobiodiversity, Conservation of biodiversity, Endangered and endemic species of India.
UNIT III	**Environmental Pollution and Solid Waste Management** Definition, Cause, Effects of Air pollution, Water pollution, Noise pollution, Radioactivepollution, Role of an individual in prevention of pollution.Solid Waste Management: Sources, effects and control measures of urban and industrial waste, e-waste management
UNIT IV	**Social Issues and the Environment** Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act-Issues involved in enforcement of environmental legislation, Rain water harvesting, Global Environmental challenges-case studies
UNIT V	**Human population and the Environment** Population growth, Women and child welfare, Role of Information technology in environmentand human health. Impact Assessment and its significances, stages of EIA Field work: A mini project related to Environmental issues / to visit a local polluted site (Submission ofproject by every student)

TEXT BOOKS	
1.	Environmental Studies for undergraduate courses by ErachBharucha,UGC.
2.	A Textbook of Environmental Studies by Dr.S.AzeemUnnisa,Acadamic publishing company.
3.	Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCE BOOKS	
1.	Text Book of Environmental Studies by Deeshita Dave & P. UdayaBhaskar, Cengage learning.
2.	Glimpses of Environment by K.V.S.G. Murali Krishna Published by Environmental Protection Society, Kakinada, A.P.
3.	Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi
4.	Environmental Studies by PiyushMalaviya, Pratibha Singh, Anoopsingh: Acme Learning, New Delhi.
5.	An Introduction to Environmental Pollution by Dr.B.k.Sharma AND Dr.(Miss)H.kaur,Goel publishing House ,a unit of Krishna Prakasham Media (p) LH,Meerut –India
WEB RESOURCES	
1.	**UNIT-1: MULTI DISPLINARY NATURE OF ENVIRONMENT and NATURALRESOURCES** http://www.defra.gov.uk/environment/climatechange https://www.climatesolutions.org https://en.wikibooks.org/wiki/Ecology/Ecosystems
2.	**UNIT-2:ECOSYSTEM, BIODIVERSITY AND ITS CONSERVATION** http://conbio.net/vl/ and www.biodiversitya-z.org/content/biodiversity
3.	**UNIT-3: ENVIRONMENTAL POLLUTION** https://www.omicsonline.org/environment-pollution-climate-change.php and https://www.britannica.com/technology/solid-waste-management
4.	**UNIT-4: SOCIAL ISSUES AND THE ENVIRONMENT** http://www.publichealthnotes.com/solid-waste-management/
5.	**UNIT-5: HUMANPOPULATION AND THE NVIRONMENT**http://www.ecoindia.com/education/water-conservation.html https://thewaterproject.org/water_conservation\ https://legalcareerpath.com/what-is-environmental-law/

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Computer Science and Engineering

Transforms and Vector Calculus
Common to CE, ME, ECE, CSE, CSE(AI&ML), CSE(AI), CSE(DS), IT

Course Category	Basic Sciences	**Course Code**	20BM3T03
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2	The skills derived from the course will help the student form a necessary base to develop analytic and design concepts.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Examine the properties of Laplace transformation	K3
CO2	Solve ordinary differential equations by using Laplace transformation technique	K2
CO3	Expand a periodic function as a Fourier series and find Fourier transform of a given function.	K3
CO4	Understand vector differential properties of scalar and vector point functions and their applications	K2
CO5	Apply Green's, Stokes and Divergence theorem to evaluate line, surface and volume integrals.	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-

COURSE CONTENT	
UNIT I	**Laplace transforms:** Laplace transforms of standard functions – Properties - Periodic functions - Unit step function – Dirac's delta function.
UNIT II	**Inverse Laplace transforms:** Inverse Laplace transforms – Properties – Convolution theorem (without proof). **Applications:** Solving ordinary differential equations (initial value problems) using Laplace transforms.
UNIT III	**Fourier Analysis:** Introduction- Periodic functions – Dirichlet's conditions - Fourier series of a function, even and odd functions –Change of interval – Half-range sine and cosine series. Fourier integral theorem (without proof) – Fourier sine and cosine integrals – sine and cosine transforms – Inverse transforms.
UNIT IV	**Vector Differentiation:** Gradient - Directional derivative - Divergence – Curl – Laplacian and second order operators – Vector identities.
UNIT V	**Vector Integration:** Line integral – Work done – Potential function – Area, Surface and volume integrals - Vector integral theorems: Greens, Stokes and Gauss Divergence theorems(without proof) and related problems.

TEXT BOOKS	
1.	**B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	**Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
REFERENCE BOOKS	
1.	**Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
2.	**Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
3.	**Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
4.	**Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
5.	**T.K.V. Iyengar et. al.,** Engineering Mathematics Volume I & III S Chand Publications.
6.	**Murray R Speigel,** Schaum's Outline of Vector Analysis, Schaum's Outline.
7.	**Shanti Narayan**, Integral Calculus – Vol. 1 & II
WEB RESOURCES	
1.	**UNIT I: Laplace transforms** https://en.wikipedia.org/wiki/Laplace_transform https://web.stanford.edu/~boyd/ee102/laplace.pdf
2.	**UNIT II: Inverse Laplace transforms** https://www.intmath.com/laplace-transformation/7-inverse-laplace-transform.php
3.	**Unit – III: Fourier Analysis** https://www.mathsisfun.com/calculus/fourier-series.html https://lpsa.swarthmore.edu/Fourier/Xforms/FXformIntro.html
4.	**UNIT IV: Vector Differentiation** https://en.wikipedia.org/wiki/Vector_calculus
5.	**UNIT V: Vector Integration** https://en.wikipedia.org/wiki/Divergence_theorem http://tutorial.math.lamar.edu/Classes/CalcIII/StokesTheorem.aspx

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Computer Science and Engineering

Advanced Data Structures through C
Common to CSE, CSE (AI&ML), CSE(AI), CSE (DS), IT

Course Category	Professional Core	**Course Code**	20CS3T04
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Data Structures	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Comprehensive understanding of dictionaries, hashing mechanism which supports faster data retrieval and skip lists
2	Illustration of Balanced trees and their operations.
3	Comprehension of heaps, queues and their operations Priority Queues.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Develop symbol table using hashing techniques	K3
CO2	Implement priority queues using Binary heap and Binomial Queue and their applications	K3
CO3	Analyze algorithms for Height balanced trees such as AVL trees, red-black trees.	K3
CO4	Analyze algorithms for Height balanced trees B-trees and B+ trees	K3
CO5	Develop algorithms for digital search trees, binary tries and patricia	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	2	-	-	-	-	-	-	-	-	-	2	2
CO2	3	3	3	2	-	-	-	-	-	-	-	-	-	2	2
CO3	3	3	3	2	-	-	-	-	-	-	-	-	-	2	2
CO4	3	3	3	2	-	-	-	-	-	-	-	-	-	2	2
CO5	3	3	3	2	-	-	-	-	-	-	-	-	-	2	2

COURSE CONTENT	
UNIT I	**HASHING:** Introduction-Static Hashing- Hash Table- Hash Functions- Secure Hash Function- Overflow Handling- Theoretical Evaluation of Overflow Techniques, Dynamic Hashing- Motivation for Dynamic Hashing -Dynamic Hashing Using Directories- Directory less Dynamic, Hashing.
UNIT II	**PRIORITY QUEUES (HEAPS):** Model, Simple Implementation, Binary Heap-Structure Property-Heap-Order Property-Basic Heap Operations- Other Heap Operation, Applications of Priority Queues- The Selection Problem Event Simulation Problem, Binomial Queues- Binomial Queue Structure – Binomial Queue Operation Implementation of Binomial Queues
UNIT III	**EFFICIENT BINARY SEARCH TREES:** Optimal Binary Search Trees, AVL Trees, Red-Black Trees, Definition- Representation of a RedBlack Tree- Searching a Red-Black Tree- Inserting into a Red Black Tree- Deletion from a RedBlack Tree- Joining Red-Black Trees, Splitting a Red-Black tree
UNIT IV	**MULTIWAY SEARCH TREES:** M-Way Search Trees, Definition and Properties- Searching an M-Way Search Tree, B-Trees, Definition and Properties- Number of Elements in a B-tree- Insertion into B-Tree- Deletion from a B-Tree- B+-Tree Definition- Searching a B+-Tree- Insertion into B+-tree- Deletion from a B+-Tree.
UNIT V	**DIGITAL SEARCH STRUCTURES:** Digital Search Trees, Definition- Search, Insert and Delete- Binary tries and Patricia, Binary Tries, Compressed Binary Tries- Patricia, Multiway Tries- Definitions- Searching a Trie- Sampling Strategies- Insertion into a Trie- Deletion from a Trie- Keys with Different Length- Height of a TrieSpace Required.

TEXT BOOKS	
1.	Fundamentals of DATA STRUCTURES in C: 2nd ed. Horowitz , Sahani, Anderson-freed,
	Universities Press
2.	Data structures and Algorithm Analysis in C, 2nd ed. Mark Allen Weiss, Pearson
REFERENCE BOOKS	
1.	Data Structures, a Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage.
2.	File Structures :An Object oriented approach with C++, 3rd ed, Michel J Folk, Greg Riccardi, Bill Zoellick
3.	Data Structures and Algorithms : Concepts, Techniques and Applications, GAV Pai, Tata McGraw Hill Corporation, ISBN: 9780070667266, 9780070667266, 2008
WEB RESOURCES	
1.	http://lcm.csa.iisc.ernet.in/dsa/dsa.html
2.	http://utubersity.com/?page_id=878
3.	http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures
4.	http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms
5.	http://lcm.csa.iisc.ernet.in/dsa/dsa.html
6.	http://utubersity.com/?page_id=878
7.	http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures
8.	http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

PRAGATI ENGINEERING COLLEGE
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Computer Science and Engineering

Operating Systems
Common to CSE, IT

Course Category	Professional Core	**Course Code**	20IT3T04
Course Type	Theory	**L-T-P-C**	3 – 0 – 0 – 3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Introduce to the internal operation of modern operating systems
2	Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
3	Understand File Systems in Operating System like UNIX/Linux and Windows
4	Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
5	Analyze Security and Protection Mechanism in Operating System

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Describe various generations of Operating System and functions of Operating System	K2
CO2	Comprehend the concept of program, process and thread andcompare various CPU Scheduling Algorithms and Inter Process Communication problems	K2
CO3	Compare various Memory Management Schemes especially pagingand Segmentation in Operating System and apply various Page Replacement Techniques	K2
CO4	Apply process synchronization techniques to avoid deadlocks	K3
CO5	Outline File Systems in Operating System like UNIX/Linux and Windows	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program : Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	1	-	-	-	-	-	-	-	2	1	-
CO2	3	3	3	2	1	-	-	-	-	-	-	2	3	1	1
CO3	3	3	2	-	1	-	-	-	-	-	-	2	3	1	-
CO4	3	3	3	3	1	-	-	-	-	-	-	2	3	1	3
CO5	3	3	3	3	1	-	-	-	-	-	-	2	3	1	3

COURSE CONTENT	
UNIT I	Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems. System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.
UNIT II	Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems. Multithreaded Programming: Multithreading models, Thread libraries, Threading issues. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling. Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem
UNIT III	Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation. Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.
UNIT IV	Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention. File Systems: Files, Directories, File system implementation, management and optimization. Secondary- Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.
UNIT V	System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer security classification. Case Studies: Linux, Microsoft Windows.

TEXTBOOKS	
1.	Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition,Wiley, 2013.
2.	Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems.)
REFERENCE BOOKS	
1.	Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, TataMcGraw-Hill, 2012.
2.	Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
3.	Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/105/106105214/

PRAGATI ENGINEERING COLLEGE
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Computer Science and Engineering

Database Management Systems
Common to CSE, CSE(AI&ML), CSE(AI), CSE(DS), IT

Course Category	Professional Core	**Course Code**	20IT3T02
Course Type	Theory	**L-T-P-C**	3 – 0 – 0 – 3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To introduce about database management systems
2	To give a good formal foundation on the relational model of data and usage of RelationalAlgebra
3	To introduce the concepts of basic SQL as a universal Database language
4	To demonstrate the principles behind systematic database design approaches by coveringconceptual design, logical design through normalization
5	To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Describe a relational database and object-oriented database	K2
CO2	Create, maintain, and manipulate a relational database using SQL	K3
CO3	Describe ER model for database design	K1
CO4	Design a database with understanding on Normalization.	K2
CO5	Understand the storage, recovery and accessing mechanisms	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program : Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	-	-	-	-	-	-	-	-	-	1	3	-
CO2	3	3	3	-	-	-	-	-	1	-	-	1	1	1	2
CO3	3	3	3	2	-	-	-	-	1	-	2	1	1	1	1
CO4	3	3	3	-	-	-	-	-	1	-	3	1	1	1	2
CO5	3	2	1	-	-	-	-	-	1	-	-	1	1	1	2

COURSE CONTENT	
UNIT I	Introduction: Database system, Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment. Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.
UNIT II	Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).
UNIT III	SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable),relational setoperations. Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing: Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning
UNIT IV	Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).
UNIT V	Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

TEXTBOOKS	
1.	Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2.	Database System Concepts,5/e, Silberschatz, Korth, TMH
REFERENCE BOOKS	
1.	Introduction to Database Systems, 8/e C J Date, PEA.
2.	Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3.	Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel,Steven Morris, Peter Robb, Cengage Learning.
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/105/106105175/
2.	https://www.geeksforgeeks.org/introduction-to-nosql/

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Mathematical Foundations For Computer Science
Common to CSE, CSE(AI&ML), CSE(AI), CSE(DS), IT

Course Category	Professional Core	**Course Code**	20IT3T03
Course Type	Theory	**L-T-P-C**	3 – 0 – 0 – 3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES

1	To introduce the students to the topics and techniques of discrete methods and combinatorialreasoning
2	To introduce a wide variety of applications. The algorithmic approach to thesolution of problems is fundamental in discrete mathematics, and this approach reinforces the close tiesbetween this discipline and the area of computer science

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Demonstrate skills in solving mathematical problems	K2
CO2	Comprehend mathematical principles and logic	K2
CO3	Practice problems related to fundamental theorems	K2
CO4	Solve recurrence relations of various types	K2
CO5	Represent graphs as mathematical structure and apply graph theory in solving computer science problems.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program : Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	2	1
CO2	3	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO3	3	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO4	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1
CO5	3	2	1	-	-	-	-	-	-	-	-	1	1	1	1

COURSE CONTENT	
UNIT I	Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.
UNIT II	Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.
UNIT III	Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem, Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat‘s and Euler‘s Theorems
UNIT IV	Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations
UNIT V	Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler‘s Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim‘s and Kruskal‘s Algorithms, BFS and DFS Spanning Trees

TEXTBOOKS	
1.	Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P.Manohar, Tata McGraw Hill.
2.	Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
3.	Theory and Problems of Discrete Mathematics, Schaum‘s Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.
REFERENCE BOOKS	
1.	Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2.	Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3.	Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2011.
4.	Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/106/106106094/

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Computer Science and Engineering

Advanced Data Structures through C Laboratory
Common to CSE, CSE(AI&ML), CSE(AI), CSE(DS), IT

Course Category	Professional Core	**Course Code**	20CS3L04
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Data Structures Laboratory	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To make the student implement efficient data structures for maintenance of data
2	To make the student implement rigid data structures for faster lookup
3	To make the student develop balanced trees and their various operations.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Implement programs for efficiently retrieving records with Hash tables and Heaps.	K3
CO2	Develop programs for, efficient data storage and text processing applications.	K3
CO3	Develop programs for implementing balanced trees and their Operations.	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	3	3	-	-	-	-	-	-	-	-	3	2	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	2	-
CO3	3	3	3	3	-	-	-	-	-	-	-	-	3	2	-

COURSE CONTENT	
1	Implement functions of Dictionary usingHashing (division method, Multiplication method, Universal hashing)
2	Consider telephone book database of N clients. Make use of a hash table implementation to quickly look up client_s telephone number
3	Implement various operations on Priority Queue
4	Read the marks obtained by students of second year in an online examination of particular subject. Find out maximum and minimum marks obtained in that subject. Use heap data structure.
5	Implement insertion operation on AVL trees.
6	Implement deletion operation on AVL trees.
7	Implement insertion operation on Red Black trees.
8	Implement deletion operation on Red Black trees.
9	Implement various operations on M-way search tree.
10	Implement various operations on B Trees
11	Implement various operations on B+ Trees
12	Implement Search Operation with Trie
13	Given an array of integers, with Trie structure find out two elements whose XOR is maximum.

TEXT BOOKS	
1.	Introduction to Algorithms," T.H. Cormen, C.E. Leiserson ,R.L. Rivest, and C. Stein, Third Edition.
2.	Data Structures with C (Schaum's Outline Series) by Seymour Lipschutz, July 2017.
REFERENCE BOOKS	
1.	Data Structures & Algorithm Analysis in C,SecondEdition,Mark Allen Weiss,PearsonEducation,India,January 2002 Edition.
2.	Algorithm Design and Applications, Michael T Goodrich, Roberto Tamassia, John Wiley,2002.
3.	Data Structures and Algorithms in C,Adam Drozdek,2004 Edition.
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/102/106102064/
2.	https://www.tutorialspoint.com/advanced_data_structures/index.asp
3.	https://www.geeksforgeeks.org/advanced-data-structures/#SelfbalancingBSTs
4.	https://www.geeksforgeeks.org/trie-insert-and-search/
5.	https://www.cs.yale.edu/homes/aspnes/pinewiki/C(2f)HashTables.html?highlight=%28CategoryAlgorithmNotes%29

Operating Systems Laboratory

Common to CSE, IT

Course Category	Professional Core	**Course Code**	20IT3L05
Course Type	Laboratory	**L-T-P-C**	0 – 0 – 3 – 1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To understand the design aspects of operating system
2	To study the process management concepts & Techniques
3	To study the storage management concepts
4	To familiarize students with the Linux environment
5	To learn the fundamentals of shell scripting/programming

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Execute UNIX commands	K2
CO2	Stimulate CPU scheduling algorithms in OS	K2
CO3	Implement page replacement algorithms in OS	K3
CO4	Implement file allocation strategies in OS	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program : Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	-	-	-	-	-	-	-	2	2	1
CO2	1	3	1	2	2	-	-	-	-	-	-	-	2	-	1
CO3	2	2	2	2	3	-	-	-	-	-	-	-	2	1	2
CO4	1	2	3	2	2	-	-	-	-	-	-	-	2	2	1

LIST OF EXPERIMENTS	
1	a) Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown. b) Study of vi editor
	c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system d) Study of Unix/Linux file system (tree structure) e) Study of .bashrc, /etc/bashrc and Environment variables.
2	Write a C program that makes a copy of a file using standard I/O, and system calls.
3	Write a C program to emulate the UNIX ls –l command.
4	Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls –l | sort
5	Simulate the following CPU scheduling algorithms: (a) Round Robin (b) SJF (c) FCFS (d) Priority
6	Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit(), System calls
7	Simulate the following: a) Multiprogramming with a fixed number of tasks (MFT) b) Multiprogramming with a variable number of tasks (MVT)
8	Simulate Bankers Algorithm for Dead Lock Avoidance
9	Simulate Bankers Algorithm for Dead Lock Avoidance
10	Simulate the following page replacement algorithms: a) FIFO b) LRU c) LFU
11	Simulate the following File allocation strategies (a) Sequenced (b) Indexed (c) Linked
12	Write a C program that illustrates two processes communicating using shared memory.
13	Write a C program to simulate producer and consumer problem using semaphores
14	Write C program to create a thread using pthreads library and let it run its function
15	Write a C program to illustrate concurrent execution of threads using pthreads library

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Computer Science and Engineering

Database Management Systems Laboratory
Common to CSE, CSE(AI&ML), CSE(AI), CSE(DS), IT

Course Category	Professional Core	**Course Code**	20IT3L04
Course Type	Laboratory	**L-T-P-C**	0 – 0 – 3 – 1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES

1	Populate and query a database using SQL DDL/DML Commands
2	Declare and enforce integrity constraints on a database
3	Writing Queries using advanced concepts of SQL
4	Programming PL/SQL including procedures, functions, cursors, and triggers

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Create database tables and perform various operations	K3
CO2	Implement PL/SQL programs	K3
CO3	Create stored packages for variables and cursors	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	-	-	-	-	-	-	1	2	2	1
CO2	3	2	2	2	2	-	-	-	-	-	-	1	2	2	1
CO3	3	3	3	3	3	-	-	-	-	-	-	1	2	2	1

LIST OF EXPERIMENTS **Note:** For performing the experiments consider any case study (ATM/ Banking/ Library/Hospitalmanagement systems)	
1	Creation, altering and dropping of tables and inserting rows into a table (use constraintswhile creating tables) examples using SELECT command.
2	Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name
	of the student who secured fourth rank in the class.
3	Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4	Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5	i. Create a simple PL/SQL program which includes declaration section, executable section, and exception –Handling section (Ex. Student marks can be selected fromthe table and printed for those who secured first class and an exception can be raisedif no records were found) ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6	Develop a program that includes the features NESTED IF, CASE and CASEexpression. The program can be extended using the NULLIF and COALESCE functions.
7	Program development using WHILE LOOPS, numeric FOR LOOPS, nestedloops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
8	Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9	Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10	Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11	Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12	Create a table and perform the search operation on table using indexing and non-indexingtechniques.
TEXTBOOKS/SUGGESTED READING:	
1	Oracle: The Complete Reference by Oracle Press
2	Nilesh Shah, "Database Systems Using Oracle‖, PHI, 2007
3	Rick F Vander Lans, –Introduction to SQL‖, Fourth Edition, Pearson Education, 2007

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Computer Science and Engineering

Skill Oriented Course Applications of Python-NumPy
CSE

Course Category	Skill Oriented Course	**Course Code**	20CS3S01
Course Type		**L-T-P-C**	0-0-4-2
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To acquire programming skills in Python package NumPy and perform mathematical and statistical operations.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Analyze how data is collected, managed and stored for processing	K4
CO2	Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems	K2
CO3	Understand how to apply some linear algebra operations to n-dimensional arrays. Use NumPy perform common data wrangling and computational tasks in Python.	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	1	2	3	3	3	-	-	-	-	-	-	-	3	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3

COURSE CONTENT	
1	NumPy Installation using different scientific python distributions(Anaconda, Python(x,y), WinPython, Pyzo)
2	NumPy Basics (np.array, np.arrange, np.linespace, np.zeros, np.ones, np.random.random, np.empty)
3	Arrays (array.shape, len(array), array.ndim, array.dtype, array.astype(type), type(array))
4	Array Manipulation (np.append, np.insert, np.resize, np.delete, np.concatenate, np.vstack, np.hstack)
5	Mathematical Operations(np.add, np.substract, np.divide, np.multiply, np.sqrt, np.sin, np.cos, np.log, np.dot, np.roots) , Statistical Operations(np.mean, np.median, np.std, array.corrcoef( ))
6	NumPy data types
7	NumPy ndarray
8	NumPy String Operations
9	NumPy Financial functions
10	NumPy Functional Programming
11	Search the maximum and minimum element in the given array using NumPy?
12	Print the checkerboard pattern of nxn using NumPy?

TEXT BOOKS	
1.	Guide to NumPy *by Travis E. Oliphant*
2.	From Python to NumPy by Nicolas P. Rougier
REFERENCE BOOKS	
1.	Elegant SciPy by Juan Nunez-Iglesias, Stefan van der Walt, and Harriet Dashnow
2.	Numerical Python: Scientific Computing and Data Science Applications with Numpy, SciPy, and Matplotlib by Robert Johansson
3.	Python for Data Analysis by Wes McKinney
WEB RESOURCES	
1.	https://numpy.org/install
2.	https://www.w3schools.com/python/numpy/numpy_intro.asp
3.	https://onlinecourses.nptel.ac.in/noc21_cs33/preview
4.	https://www.udemy.com/topic/numpy
5.	https://numpy.org/doc/stable/user/quickstart.html

Skill Oriented Course
Web Application Development using Full Stack
Frontend Development- Module – I
CSE

Course Category	Skill Oriented Course	**Course Code**	20CS3S02
Course Type		**L-T-P-C**	0-0-4-2
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To provide understanding about the core concepts of frontend programming for web application

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Analyze a web page and identify its elements and attributes.	K4
CO2	Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet	K3
CO3	Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone. Create web pages using HTML and CascadingStyle Sheets.	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	3	3	3	-	-	-	2	-	-	3	3	3	3
CO2	3	3	3	2	3	-	-	-	2	-	-	3	3	3	2
CO3	3	3	3	3	3	-	-	-	2	-	-	2	3	2	1

COURSE CONTENT	
• HTML	
1	Introduction to HTML
2	Browsers and HTML
3	Editor‘s Offline and Online
4	Tags, Attribute and Elements
5	Doctype Element
6	Comments
7	Headings, Paragraphs, and Formatting Text
8	Lists and Links
9	Images and Tables
CSS	
1	Introduction CSS
2	Applying CSS to HTML
3	Selectors, Properties and Values
4	CSS Colors and Backgrounds
5	CSS Box Model
6	CSS Margins, Padding, and Borders
7	CSS Text and Font Properties
8	CSS General Topics

TEXT BOOKS	
1.	Programming the World Wide Web, Robet W Sebesta, Pearson, 7th edition, 2005.
2	Web Technologies, Uttam K Roy, Oxford, 2010
REFERENCE BOOKS	
1.	The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrelll, Gosselin, Zak, Karparhi, Maclntyre, Morrissey, Cengage, 2003.
2.	The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer, Chris Northwood, 20 November 2018
WEB RESOURCES	
1.	http://www.w3schools.com/
2.	https://www.javatpoint.com/css-tutorial
3.	https://www.javatpoint.com/css-vs-css3
4.	https://www.studytonight.com/cascading-style-sheet/
5.	https://www.tutorialspoint.com/css/index.htm

Constitution of India

Common to CE, EEE, MECH, ECE, CSE, CSE (DS), CSE (AI&ML), CSE(AI), IT

Course Category	Mandatory Course	**Course Code**	20HM2T05
Course Type	Theory	**L-T-P-C**	2-0-0-0
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	0 0 0

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the evolution of Constitution of India	K2
CO2	Make use of one's Fundamental rights.	K3
CO3	Understand the functioning of the Union Government	K2
CO4	Understand the functioning of the State and local self Government.	K2
CO5	Understand the value of Indian Constitution in functioning of the country.	K2

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O1**	**PS O2**	**PS O3**
CO1	-	-	-	-	-	3	-	3	-	1	-	2	-	-	-
CO2	-	-	-	-	-	1	-	2	1	1	-	1	-	-	-
CO3	-	-	-	-	-	1	-	1	1	1	-	-	-	-	-
CO4	-	-	-	-	-	1	-	1	1	1	-	-	-	-	-
CO5	-	-	-	-	-	1	1	1	1	1	-	2	-	-	-

COURSE CONTENT	
UNIT I	**Introduction to Indian constitution:** Meaning of the term constitution - History and development – Preamble of the Constitution – Constituent Assembly – The salient features of
	Indian Constitution.
UNIT II	**Fundamental Rights:** Individual and Collective Rights – Limitations of the fundamental Rights – Fundamental Rights Vs Duties
UNIT III	**Union Government:** Union Legislature – Lok Sabha and Rajya Sabha (powers and functions) – President of India (powers and functions) – Prime minister of India (powers and functions) – Union Judiciary (supreme court powers and functions).
UNIT IV	**State Government:**State Legislature (Legislative Assembly / Vidhan Sabha, Legislative Council / Vidhan Parishad) – Powers and functions of state legislature – The Chief Minister of the state (powers and functions) **Local Self Government:** Election commission of India (Powers and Functions)- The Union Public Service Commission (Powers and Functions)
UNIT V	The values of the Indian Constitution and Ushering of Social Revolution in India – Nature and Role of Higher Judiciary in India – Amendments (Recent)

REFERENCE BOOKS	
1.	_Indian Polity‘ by Laxmikanth
2.	_Indian Administration‘ by Subhash Kashyap
3.	_Indian Constitution‘ by D.D. Basu
4.	_Indian Administration‘ by Avasti and Avasti
WEB RESOURCES	
1.	https://www.clearias.com/historical-background-of-indian-constitution/
2.	https://www.civilserviceindia.com/subject/General-Studies/notes/functions-and-responsibilities-of-the-union-and-the-states.html
3.	https://www.tutorialspoint.com/indian_polity/indian_polity_how_constitution_works

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Probability & Statistics
Common to CSE, CSE(AI&ML), CSE(AI), CSE(DS)

Course Category	Basic Sciences	**Course Code**	20BM4T05
Course Type	Theory	**L-T-P-C**	3 – 0 – 0 – 3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES

1	To familiarize the students with the foundations of probability and statistical methods
2	To impart probability concepts and statistical methods in various applications

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Classify the concepts of data science and its importance.	K2
CO2	Interpret the association of characteristics and through correlation and regression tools.	K3
CO3	Make use of the concepts of probability and their applications Apply discrete and continuous probability distributions .	K3
CO4	Design the components of a classical hypothesis test.	K4
CO5	Infer the statistical inferential methods based on small and large sampling tests .	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program : Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	1	-	-	-	-	-	-	-	-	-	-	-

COURSE CONTENT	
UNIT I	**Descriptive statistics and methods for data science**: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.
UNIT II	**Correlation and Curve fitting**: Correlation – correlation coefficient – rank correlation – regression coefficients and properties – regression lines – Methodof least squares – Straight line – parabola – Exponential – Power curves.
UNIT III	**Probability and Distributions**: Probability – Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.
UNIT IV	**Sampling Theory**: Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate
UNIT V	**Tests of Hypothesis:** Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

TEXTBOOKS	
1.	Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2.	S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
REFERENCE BOOKS	
1.	Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2.	Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage
3.	Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4.	Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical
	Scientists, 3rd Edition, Pearson, 2010.
WEB RESOURCES	
1.	**UNIT I:** https://en.wikipedia.org/wiki/List_of_probability_distributions https://en.wikipedia.org/wiki/Binomial_distribution
2.	**UNIT II:** https://en.wikipedia.org/wiki/Normal_distribution
3.	**UNIT III:** https://en.wikipedia.org/wiki/Sampling_(statistics) https://nptel.ac.in/courses/111104073/
4.	**UNIT IV:** https://en.wikipedia.org/wiki/Statistical_hypothesis_testing https://machinelearningmastery.com/statistical-hypothesis-tests/
5.	**UNIT V:** https://en.wikipedia.org/wiki/Regression_analysis https://www.surveysystem.com/correlation.htm

PRAGATI ENGINEERING COLLEGE
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Computer Science and Engineering

Software Engineering
Common to CSE, IT

Course Category	Professional Core	**Course Code**	20CS4T08
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Data Structures	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agileprocess
2	Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
3	Give exposure to Software Design techniques

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Ability to transform an Object-Oriented Design into high quality, executable code	K3
CO2	Skills to design, implement, and execute test cases at the Unit and Integration level	K3
CO3	Compare conventional and agile software methods	K4
CO4	Skills to design Software Architectural components.	K3
CO5	Analyze the interface analysis and Testing strategies.	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	3	-	-	-	-	-	-	1	-	-	-
CO2	3	3	2	-	2	-	-	-	-	-	-	1	2	-	-
CO3	3	2	1	3	2	-	-	-	2	-	-	2	3	-	3
CO4	3	2	3	2	3	-	-	-	2	-	-	2	3	3	3
CO5	3	3	3	2	3	-	-	-	2	-	-	3	3	3	3

COURSE CONTENT	
UNIT I	The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.
UNIT II	Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.
UNIT III	Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.
UNIT IV	Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.
UNIT V	The Golden Rules, User Interface Analysis and Design, Interface Analysis, InterfaceDesign Steps, WebApp Interface Design, Design Evaluation, Elements of Software Qualtiy Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

TEXT BOOKS	
1.	Software Engineering a practitioner‘s approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2.	Software Engineering, Ian Sommerville, Ninth Edition, Pearson.
REFERENCE BOOKS	
1.	Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2.	Software Engineering, Ugrasen Suman, Cengage.
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/105/106105182/
2.	https://nptel.ac.in/courses/106/105/106105182/
3.	https://nptel.ac.in/courses/106/101/106101061/
4.	https://www.coursera.org/learn/software-processes-and-agile-practices
5.	http://www.geeksforgeeks.org/software-engineering-gq/

PRAGATI ENGINEERING COLLEGE
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Computer Science and Engineering

Formal Languages and Automata Theory
CSE

Course Category	Professional Core	**Course Code**	20CS4T09
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Data Structures	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn fundamentals of Regular and Context Free Grammars and Languages
2	To understand the relation between Regular Language and Finite Automata and machines
3	To learn how to design Automata‘s and machines as Acceptors, Verifiers and Translators

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Classify machines by their power to recognize languages.	K4
CO2	Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy	K3
CO3	Employ finite state machines to solve problems in computing	K4
CO4	Illustrate deterministic and non-deterministic machines	K4
CO5	Quote the hierarchy of problems arising in the computer science	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	2	3	3	3	-	-	-	-	-	-	-	2	3	3
CO2	2	2	3	3	3	-	-	-	-	-	-		2	3	3
CO3	1	2	3	3	3	-	-	-	-	-	-	-	3	3	3
CO4	1	2	3	3	3	-	-	-	-	-	-	-	2	3	3
CO5	1	2	3	3	3	-	-	-	-	-	-	-	3	3	3

COURSE CONTENT	
UNIT I	Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with Є-Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata.
UNIT II	Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.
UNIT III	Formal Languages, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, Є-Productions and Unit Productions, Normal Forms-Chomsky NormalForm and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications ofContext Free Grammars.
UNIT IV	Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata,Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars, Conversion, Two Stack Pushdown Automata,Application of Pushdown Automata.
UNIT V	Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church‘s Thesis, Universal and Restricted TM, Decidable and Un-decidableProblems, Halting Problem of TMs, Post‘s Correspondence Problem, Modified PCP, Classes of P and NP, NP-Hard and NP-Complete Problems.

TEXT BOOKS	
1.	Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
2.	Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007
REFERENCE BOOKS	
1.	Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
2.	Formal Language and Automata Theory, K. V. N. Sunitha, N. Kalyani,2nd Edition, Pearson Education, 2015
3.	An Introduction to Formal Languages and Automata, Peter Linz, 6th Edition, Jones & Bartlett Learning, 2017
4.	Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/104/106104028/
2.	https://www.udemy.com/learnanything/anytimeanywhere
3.	Florida Tech, CS: Formal Languages and Automata (Fall 2021) (fit.edu)
4.	https://merascu.github.io/links/FLAT.html
5.	https://eecs.wsu.edu/~ananth/CptS317

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Java Programming
Common to CSE, CSE(AI&ML), CSE(AI), CSE(DS), IT

Course Category	Professional Core	**Course Code**	20CS4T10
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Data Structures	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
2	To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
3	To understand how to design applications with threads and JDBC connections in Java

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Differentiate the application of decision and iteration control structures.	K2
CO2	Implements the concepts of Java such as classes, method overloading and various keywords.	K3
CO3	Apply the concept of inheritance and interfaces.	K3
CO4	Able to implements the concepts of Packages and Exception handling.	K3
CO5	Able to Analyze & Implement the concepts of Multi threading and JDBC Connections.	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	2	3	-	-	-	-	-	-	-	3	3	2
CO2	3	3	3	2	3	-	-	-	-	-	-	-	3	3	2
CO3	3	3	3	2	3	-	-	-	-	-	-	-	3	3	2
CO4	3	3	3	2	3	-	-	-	-	-	-	-	3	3	2
CO5	3	3	3	2	3	-	-	-	-	-	-	-	3	3	2

COURSE CONTENT	
UNIT I	Program Structure in Java: Introduction, Writing Simple Java Programs, Tokens in Java Programs, Command Line Arguments, Comments. Data Types, Variables, and Operators: Introduction, Data Types in Java, Static Variablesand Methods, Attribute Final, Operators. Control Statements: If Expression, Switch Statement, Loops.
UNIT II	Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this. Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.
UNIT III	Arrays: Introduction, Operations on Array Elements, Sorting and Searching, Two- dimensional Arrays Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance. Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces
UNIT IV	Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Java.lang Package and its Classes, class Math, Wrapper Classes, Java util Classes and Interfaces, Time Package, Class Instant (java.time.Instant). Exception Handling: Introduction, Keywords throws and throw, try, catch, and finallyBlocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions
UNIT V	String Handling in Java: Introduction, Interface Char Sequence, Class String, String Methods, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder. Introducing the AWT: Graphics,Text, Layout Managers, Menus and ImagesSwing: Origins, Features, MVC Connection, Components and Containers Multithreaded Programming: Introduction, Thread Class, Main Thread- Creation of NewThreads, Thread States Java Database Connectivity: Introduction, JDBC Architecture, Establishing JDBC Database Connections

TEXT BOOKS	
1.	Introduction to Java Programming, 7th edition by Y Daniel Liang, Pearson
2.	The complete Reference Java, 8th edition, Herbert Schildt, TMH.
REFERENCE BOOKS	
1.	JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2.	Murach's Java Programming, Joel Murach
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/105/106105191/
2.	https://www.w3schools.com/java/java_data_types.asp
3.	https://docs.oracle.com/javase/tutorial/java/index.html

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Managerial Economics and Financial Analysis
Common to CSE, CSE(AI&ML), CSE(AI), CSE(DS)

Course Category	Humanities and Social Sciences	**Course Code**	20HM4T01
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Make use of the concepts of managerial economics and demand in managerial decision making and predicting demand for goods and services	Applying
CO2	Assess the functional relation among production, cost of production, cost concepts and Break-Even Analysis.	Evaluating
CO3	Classify market structures for price and output decisions and Appraise the forms of business organizations and trade cycles in economicgrowth.	Understanding
CO4	Make use of the final accounting statements in financial decision making	Applying
CO5	Apply capital budgeting techniques in financial decision making	Applying

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	1	-	-	-	-	-	-	-	-	3	-	-	-	-
CO3	-	1	-	-	-	-	-	-	2	-	-	1	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-
CO5	-	3	-	-	-	-	-	-	-	-	3	2	-	-	-

COURSE CONTENT	
UNIT I	Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics and Scope-Managerial Economics and its relation with other subjects-Basic Economic Tools used in Managerial Economics-Concepts of Demand-Types-Determinants-Law of Demand its Exceptions-Elasticity of Demand-Types and Measurement- Demand forecasting and Methods of demand forecasting (Opinion survey methods, Trend line by observation, least squares method and barometric techniques)
UNIT II	Production and Cost Analysis: Production function- Law of Variable proportions- Iso- quants and Isocosts- Laws of Returns to Scale-Cobb-Douglas Production function- Economies of Scale-Cost Concepts- Fixed vs Variable Costs-Out of Pocket Costs vs Imputed Costs-Cost Volume Profit analysis-Determination of Break-Even Point (Simple Problems).
UNIT III	Introduction to Markets, Pricing Policies and Types of Business Organizations: Market Structures: Perfect Competition, Monopoly, Monopolistic and Oligopoly – Features – Price and Output Determination. Pricing Policies: Methods of Pricing: Limit Pricing, Market Skimming Pricing, Internet Pricing: Flat Rate Pricing, Usage sensitive, Transaction based pricing, Priority Pricing. Types of Business Organization and Business Cycles: Features and Evaluation of Sole Trader – Partnership – Joint Stock Company – State/Public Enterprises and their forms – Business Cycles – Meaning and Features – Phases of Business Cycles.
UNIT IV	Introduction to Accounting and Capital Budgeting: Introduction to Double Entry Systems-Journal-Ledger- Trail Balance - Preparation of Final Accounts (Simple Problems)
UNIT V	Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Needfor Capital Budgeting-Techniques of Capital Budgeting-Traditional and Modern Methods(Simple Problems)

TEXT BOOKS	
1.	Dr. A. R. Aryasri – Managerial Economics and Financial Analysis – TMH- 2018
2.	Dr. N. Appa Rao, Dr. P. Vijay Kumar - _Managerial Economics and Financial Analysis‘ - Cengage Publications – 2012
REFERENCE BOOKS	
1.	V. Maheswari -Managerial Economics - Sultan Chand & Sons – 2014.
2.	Suma Damodaran - Managerial Economics - Oxford - 2011.
3.	Vanitha Agarwal - Managerial Economics - Pearson Publications- 2011.
4.	V.Maheswari - Financial Accounting- Vikas Publications – 2018.
5.	S. A. Siddiqui & A. S. Siddiqui - Managerial Economics and Financial Analysis - New Age International Publishers - 2012
WEB RESOURCES	
1.	https://economictimes.indiatimes.com/definition/law-of-supply
2.	https://sites.google.com/site/economicsbasics/managerial-theories-of-the-firm
3.	https://www.managementstudyguide.com/capitalization.htm

Software Engineering Laboratory

CSE

Course Category		**Course Code**	20CS4L09
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To acquire the generic software development skill through various stages of software life cycle and also to ensure the quality of software through software development with variousprotocol based environment

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project	K2
CO2	Prepare SRS document, design document, test cases and software configuration management and risk management related document.	K3
CO3	Develop function oriented and object oriented software design using tools like rational rose. use modern engineering tools necessary for software project management, estimations, time management and software reuse. generate test cases for software testing	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	2	2	2	-	-	-	-	-	-	-	1	1	1
CO2	2	2	3	2	3	-	-	-	-	-	-	-	1	1	1
CO3	2	2	2	2	3	-	-	-	-	-	-	-	1	1	1

COURSE CONTENT	
Perform the following, for the following experiments (1-4): i. Do the Requirement Analysis and Prepare SRS ii. Draw E-R diagrams, DFD, CFD and structured charts for the project.	
1	Course Registration System
2	Students Marks Analyzing System
3	Online Ticket Reservation System
4	Stock Maintenance
5	Consider any application, using COCOMO model, estimate the effort.
6	Consider any application, Calculate effort using FP oriented estimation model.
7	Draw the UML Diagrams for the problem 1,2, 3, 4.
8	Design the test cases for e-Commerce application (Flipcart, Amazon)
9	Design the test cases for a Mobile Application (Consider any example from Appstore)
10	Design and Implement ATM system through UML Diagrams.

TEXT BOOKS	
1.	Software Engineering a practitioner‘s approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2.	Software Engineering, Ian Sommerville, Ninth Edition, Pearson.
REFERENCE BOOKS	
1.	Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2.	Software Engineering, Ugrasen Suman, Cengage.
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/105/106105182/
2.	https://www.geeksforgeeks.org/software-engineering/

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

R Programming Laboratory

Common to CSE, CSE(AI&ML), CSE(AI), CSE(DS), IT

Course Category		**Course Code**	20CS4L10
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	Student will learn about the fundamentals of R programming, standard R libraries, solid understanding of R functions,write programs using the R and gain skills in R programming Language, get acquaintances with Arrays, Files, Strings, Packages, and distributions using R.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Implement basic concepts of R programming, and its different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming.	K3
CO2	Implement the concepts of R Script to extract the data from data frames and file operations.	K4
CO3	Implement the various statistical techniques using R. Extend the functionality of R by using add-on packages. Use R Graphics and Tables to visualize results of various statistical operations on data.	K6

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	2	3	3	3	3	-	-	-	-	-	-	3	3	3	3
CO2	2	2	3	3	3	-	-	-	-	-	-	3	3	3	3
CO3	2	3	3	3	3	-	-	-	-	-	-	3	3	3	3

COURSE CONTENT	
Week 1	Installing R and RStudio Basic functionality of R, variable, data types in R
Week 2	a) Implement R script to show the usage of various operators available in R language. b) Implement R script to read person_s age from keyboard and display whether he iseligiblefor voting ornot. c) Implement R script to find biggest number between two numbers. d) Implement R script to check the given year is leap year ornot.
Week 3	a) Implement R Script to create a list. b) Implement R Script to access elements in the list. c) Implement R Script to merge two or more lists. Implement R Script to perform matrix operation
Week 4	Implement R script to perform following operations: a) various operations on vectors b) Finding the sum and average of given numbers using arrays. c) To display elements of list in reverse order.

	d) Finding the minimum and maximum elements in the array.
Week 5	a) Implement R Script to perform various operations on matrices b) Implement R Script to extract the data from dataframes. c) Write R script to display file contents. d) Write R script to copy file contents from one file to another
Week 6	a)Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars& cars datasets. b) Write an R script to find subset of dataset by using subset (), aggregate () functions on irisdataset
Week 7	a)Reading different types of data sets (.txt, .csv) from Web or disk and writing in file inspecific disk location. b) Reading Excel data sheet in R. c)Reading XML dataset in R
Week 8	a) Implement R Script to create a Pie chart, Bar Chart, scatter plot and Histogram (Introduction toggplot2 graphics) b) Implement R Script to perform mean, median, mode, range, summary, variance, standard deviation operations.
Week 9	a) Implement R Script to perform Normal, Binomial distributions. b) Implement R Script to perform correlation, Linear and multiple regression.
Week 10	Introduction to Non-Tabular Data Types: Time series, spatial data, Network data. Data Transformations: Converting Numeric Variables into Factors, Date Operations, String Parsing, Geocoding
Week 11	Introduction Dirty data problems: Missing values, data manipulation, duplicates, forms of data dates,outliers, spelling
Week 12	Data sources: SQLite examples for relational databases, Loading SPSS and SAS files, Reading from Google Spreadsheets, API and web scraping examples

TEXT BOOKS	
1.	The R Book, by Michael J. Crawley, 2012. Wiley, 1076 p. ISBN-13: 978-0470973929
2.	An Introduction using R, by Michael J. Crawley, 2014. John Wiley & Sons, 360 p. ISBN-13: 978-1118941096
REFERENCE BOOKS	
1.	R Cookbook Paperback – 2011 by Teetor Paul O Reilly Publications
2.	Beginning R: The Statistical Programming Language by Dr. Mark Gardener, Wiley Publications
3.	R Programming For Dummies by JorisMeysAndrie de Vries, Wiley Publications
4.	Hands-On Programming with R by Grolemund, O Reilly Publications
5.	Statistical Programming in R by KG Srinivas G.M. Siddesh, ChetanShetty&Sowmya B.J. - 2017 edition
6.	R Fundamentals and Programming Techniques, ThomasLumely.
7.	R for Everyone Advanced Analytics and Graphics, Jared P. Lander- Addison Wesley Series
8.	The Art of R Programming, Norman Matloff, Cengage Learning
9.	Maria Dolores Ugarte, Ana F.Militino, AlanT.Arnholt—Probability and Statistics with R, 2nd Edition, CRC Press,2016.
10.	R-programming for Data science, Roger D.Peng.
11.	An Introduction to statistical learning-with applications in R, Trevor Hastie and Rob Tibshirani.
WEB RESOURCES	
1.	URL: https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf (Online Resources)
2.	http://nptel.ac.in/courses/106104135/48
3.	http://nptel.ac.in/courses/110106064/
SOFTWARE Requirements	
1.	The R statistical software program. Available from: https://www.r-project.org/
2.	RStudio an Integrated Development Environment (IDE) for R. Available from: https://www.rstudio.com/

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Java Programming Laboratory
Common to CSE, CSE(AI&ML), CSE(AI), CSE(DS), IT, ECE

Course Category		**Course Code**	20CS4L12
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	Practice programming in the Java
2	Gain knowledge of object-oriented paradigm in the Java programming language
3	Learn use of Java in a variety of technologies and on different platforms

COURSE OUTCOMES **Upon successful completion of the course, the student will be able to:**		**BTL**
CO1	Evaluate default value of all primitive data type, Operations, Expressions, Controlflow, Strings	K3
CO2	Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism	K3
CO3	Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	3	3	2	0	0	0	0	0	0	0	0	3	2	3
CO2	3	3	3	2	0	0	0	0	0	0	0	0	3	2	3
CO3	3	3	3	2	0	0	0	0	0	0	0	0	3	2	3

COURSE CONTENT	
1	**Exercise - 1** (Basics) a) Write a JAVA program to display default value of all primitive data type of JAVA b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate thediscriminate D and basing on value of D, describe the nature of root. c) Five Bikers Compete in a race such that they drive at a constant speed which may or maynot be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speedof qualifying racers.
2	**Exercise - 2** (Operations, Expressions, Control-flow, Strings) a) Write a JAVA program to search for an element in a given list of elements using binarysearch mechanism. b) Write a JAVA program to sort for an element in a given list of elements using bubble sort c) Write a JAVA program to sort for an element in a given list of elements using merge sort. d) Write a JAVA program using StringBuffer to delete, remove character.
3	**Exercise - 3** (Class, Objects) a) Write a JAVA program to implement class mechanism. Create a class, methods and invokethem inside main method. b) Write a JAVA program to implement constructor.
4	**Exercise - 4** (Methods) a) Write a JAVA program to implement constructor overloading. b) Write a JAVA program implement method overloading.
5	**Exercise - 5** (Inheritance) a) Write a JAVA program to implement Single Inheritance

	b) Write a JAVA program to implement multi level Inheritance c) Write a java program for abstract class to find areas of different shapes
6	**Exercise - 6** (Inheritance - Continued) a) Write a JAVA program give example for –super‖ keyword. b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
7	**Exercise - 7** (Exception) a) Write a JAVA program that describes exception handling mechanism b) Write a JAVA program Illustrating Multiple catch clauses
8	**Exercise – 8 (**Runtime Polymorphism) a) Write a JAVA program that implements Runtime polymorphism b) Write a Case study on run time polymorphism, inheritance that implements in aboveproblem
9	**Exercise – 9** (User defined Exception) a) Write a JAVA program for creation of Illustrating throw b) Write a JAVA program for creation of Illustrating finally c) Write a JAVA program for creation of Java Built-in Exceptions d) d)Write a JAVA program for creation of User Defined Exception
10	**Exercise – 10** (Threads) a) Write a JAVA program that creates threads by extending Thread class .First thread display
	–Good Morning –every 1 sec, the second thread displays –Hello –every 2 seconds and the third display –Welcome‖ every 3 seconds ,(Repeat the same by implementing Runnable) **b)** Write a program illustrating **isAlive** and **join ()** c) Write a Program illustrating Daemon Threads.
11	**Exercise - 11** (Threads continuity) a) Write a JAVA program Producer Consumer Problem b) Write a case study on thread Synchronization after solving the above producer consumerproblem
12	**Exercise – 12** (Packages) a) Write a JAVA program illustrate class path b) Write a case study on including in class path in your os environment of your package. c) Write a JAVA program that import and use the defined your package in the previous Problem
13	**Exercise - 13** (Applet) a) Write a JAVA program to paint like paint brush in applet. b) Write a JAVA program to display analog clock using Applet. c) Write a JAVA program to create different shapes and fill colors using Applet.
14	**Exercise - 14** (Event Handling) a) Write a JAVA program that display the x and y position of the cursor movement using Mouse. b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.
15	**Exercise-15** (AWT & Swings) a) Write a Java Program to create a frame with three buttons and Radio Button b) Write a Java Program to print text in different colors c) Write a JAVA program that to create a single ball bouncing inside a JPanel.
16	**Exercise-16** (JDBC) a) Write a Java program to Connect database b) Write a Java Program to insert, update, delete & select records

TEXT BOOKS	
1.	JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2.	The complete Reference Java, 8th edition, Herbert Schildt, TMH.
REFERENCE BOOKS	
1.	Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2.	Murach's Java Programming, Joel Murach
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/105/106105191/
2.	https://www.w3schools.com/java/java_data_types.asp

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Skill Oriented Course Applications of Python-Pandas
CSE

Course Category	**Skill Oriented Course**	**Course Code**	20CS4S04
Course Type	Laboratory	**L-T-P-C**	0-0-4-2
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To understand the fundamentals of the Pandas library in Python and how it is used to handle data and also develop basic skills in data analysis and visualization

COURSE OUTCOMES **Upon successful completion of the course, the student will be able to:**		**BTL**
CO1	Use Pandas to create and manipulate data structures like Series and DataFrames.	K3
CO2	Work with arrays, queries, and dataframes	K3
CO3	Query DataFrame structures for cleaning and processing and manipulating files. Understand best practices for creating basic charts	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	2	3	3	3	-	-	-	-	-	1	-	3	3	3
CO2	3	2	3	3	3	-	-	-	-	-	1	-	3	3	3
CO3	3	2	3	3	3	-	-	-	-	-	1	-	3	3	3

COURSE CONTENT

Perform the following:

1) Pandas Installation

2) Creating DataFrames

1	**Pandas Data Series:** 1) Write a Pandas program to create and display a one-dimensional array-like object containing an array of data using Pandas module. 2) Write a Pandas program to convert a Panda module Series to Python list and it's type. 3) Write a Pandas program to add, subtract, multiple and divide two Pandas Series. 4) Write a Pandas program to convert a NumPy array to a Pandas series. Sample Series: NumPy array: [10 20 30 40 50] Converted Pandas series:0 10 1 20 2 30 3 40

	4 50 dtype: int64
2	**Pandas Data Frames:** Consider Sample Python dictionary data and list labels: exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael','Matthew', 'Laura', 'Kevin', 'Jonas'], 'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19], 'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1], 'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']} labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j'] 1) Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels. 2) Write a Pandas program to change the name 'James' to 'Suresh' in name column of the DataFrame. 3) Write a Pandas program to insert a new column in existing DataFrame. 4) Write a Pandas program to get list from DataFrame column headers. 5) Write a Pandas program to get list from DataFrame column headers.
3	**Pandas Index:** 1) Write a Pandas program to display the default index and set a column as an Index in agiven dataframe. 2) Write a Pandas program to create an index labels by using 64-bit integers, using floating-point numbers in a given dataframe.
4	**Pandas String and Regular Expressions:** 1) Write a Pandas program to convert all the string values to upper, lower cases in agiven pandas series. Also find the length of the string values. 2) Write a Pandas program to remove whitespaces, left sided whitespaces and right sided whitespaces of the string values of a given pandas series. 3) Write a Pandas program to count of occurrence of a specified substring in a
	DataFrame column. 4) Write a Pandas program to swap the cases of a specified character column in a given DataFrame.
5	**Pandas Joining and merging DataFrame:** 1) Write a Pandas program to join the two given dataframes along rows and assign alldata. 2) Write a Pandas program to append a list of dictioneries or series to a existing DataFrame and display the combined data. 3) Write a Pandas program to join the two dataframes with matching records from bothsides where available.
6	**Pandas Time Series:** 1) Write a Pandas program to create a) Datetime object for Jan 15 2012. b) Specific date and time of 9:20 pm. c) Local date and time. d) A date without time. e) Current date. f) Time from a datetime. g) Current local time. 2) Write a Pandas program to create a date from a given year, month, day and anotherdate from a given string formats. 3) Write a Pandas program to create a time-series with two index labels and randomvalues. Also print the type of the index.
	Pandas Grouping Aggregate:

7	1) Write a Pandas program to split the following dataframe into groups based on schoolcode. Also check the type of GroupBy object. 2) Write a Pandas program to split the following dataframe by school code and getmean, min, and max value of age for each school.
8	**Pandas Styling:** 1) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the negative numbers red and positive numbers black. 2) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the maximum value in each column. 3) Create a dataframe of ten rows, four columns with random values. Write a Pandasprogram to highlight dataframe's specific columns.
9	**Excel:** 1) Write a Pandas program to import excel data into a Pandas dataframe.
	2) Write a Pandas program to find the sum, mean, max, min value of a column of file.
10	**Plotting:** 1) Write a Pandas program to create a horizontal stacked bar plot of opening, closing stockprices of any stock dataset between two specific dates. 2) Write a Pandas program to create a histograms plot of opening, closing, high, low stockprices of stock dataset between two specific dates. 3) Write a Pandas program to create a stacked histograms plot of opening, closing, high, lowstock prices of stock dataset between two specific dates with more bins.
11	**Pandas SQL Query:** 1) Write a Pandas program to display all the records of a student file. 2) Write a Pandas program to select distinct department id from employees file.

TEXT BOOKS	
1.	Wes McKinney, Python for Data Analysis, O_Reilly, 2nd Edition, 2017.
REFERENCE BOOKS	
1.	Sinan Ozdemir, Principles of Data Science, Packt Publishers, 2nd Edition, 2018
2.	John Paul Mueller, Luca Massaron, Python for Data Science for Dummies, 2nd Edition, Wiley, 2015.
3.	Rachel Schutt, Cathy O_Neil, Doing Data Science: Straight Talk from the Frontline, O_Reilly, 2014.
WEB RESOURCES	
1.	https://swayam.gov.in/nd1_noc19_cs60/preview
2.	https://towardsdatascience.com
3.	https://www.w3schools.com/datascience
4.	https://github.com/jakevdp/PythonDataScienceHandbook
5.	https://www.kaggle.com

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Skill Oriented Course
Web Application Development using Full Stack – FrontendDevelopment II

CSE

Course Category		**Course Code**	20CS4S05
Course Type	Laboratory	**L-T-P-C**	0-0-4-2
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To build strong foundation of JavaScript which will help developer to apply JavaScript concepts for responsive web frontend development

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Develop of the major Web application tier- Client side development	K3
CO2	Participate in the active development of cross-browser applications through JavaScript	K3
CO3	Develop JavaScript applications that transition between states	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	2	3	-	-	-	-	-	-	2	3	2	3
CO2	3	3	3	2	3	-	-	-	-	-	-	2	3	2	3
CO3	3	3	3	2	3	-	-	-	-	-	-	2	3	2	3

COURSE CONTENT Perform experiments related to the following concepts:	
1	Introduction to JavaScript
2	Applying JavaScript (internal and external)
3	Understanding JS Syntax
4	Introduction to Document and Window Object
5	Variables and Operators
6	Data Types and Num Type Conversion
7	Math and String Manipulation
8	Objects and Arrays
9	Date and Time
10	Conditional Statements
11	Switch Case
12	Looping in JS
13	Functions
14	Design and development of Online Book Shop using JSP/Node.js & React.js
15	Design and development of Online Examination using JSP/Node.js & React.js

TEXT BOOKS	
1.	Programming the World Wide Web, Robet W Sebesta, Pearson, 7th edition, 2005.
2.	Web Technologies,Uttam K Roy, Oxford, 2010.
REFERENCE BOOKS	
1.	The Web Warrior Guide to Web Programming, Bai, Ekedahl, Farrelll, Gosselin, Zak, Karparhi, Maclntyre, Morrissey, Cengage, 2003.
2.	The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer,Chris Northwood, 20 November 2018.
3.	Full-Stack JavaScript Development: Develop, Test and Deploy with MongoDB, Express, Angular
	and Node on AWS,Eric Bush, Maura van der Linden,2016
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/105/106105084/
2.	https://www.coursera.org/learn/html-css-javascript-for-web-developers
3.	www.w3schools.com
4.	https://javascript.info/
5.	https://www.javatpoint.com/javascript-tutorial

Essence of Indian Traditional Knowledge

Common to CSE, CSE(AI&ML), CSE(AI), CSE(DS)

Course Category	Humanities and Social Sciences	**Course Code**	20HM4T06
Course Type	Mandatory	**L-T-P-C**	2-0-0-0
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the concept of Traditional knowledge and its importance	Understanding
CO2	Know the need and importance of protecting traditional knowledge	Understanding
CO3	Know the various enactments related to the protection of traditional knowledge	Understanding
CO4	Understand the concepts of Intellectual property to protect the traditional knowledge	Understanding
CO5	Understand the importance of Traditional Knowledge in the development of different sectors	Understanding

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O1**	**PS O2**	**PS O3**
CO1	1	1	2	-	-	3	-	1	-	2	-	-	-	-	-
CO2	-	-	2	-	-	2	-	2	1	-	-	2	-	-	-
CO3	-	-	1	-	-	3	2	3	1	2	-	1	-	-	-
CO4	-	-	-	-	-	2	1	3	1	1	-	1	-	-	-
CO5	1	-	1	-	-	3	1	1	1	3	-	1	-	-	-

COURSE CONTENT	
UNIT I	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à- vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge
UNIT II	Protection of Traditional Knowledge: The need for protecting traditional knowledge - Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge
UNIT III	Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.Geographical indications act 2003.
UNIT IV	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.
UNIT V	Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

REFERENCE BOOKS	
1.	Traditional Knowledge System in India, by Amit Jha, 2009.
2.	Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3.	Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya
4.	Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan
5.	Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.
6.	Pramod Chandra, India Arts, Howard Univ. Press, 1983.
7.	Krishna Chaitanya, Arts of India, Abhinav Publications, 1987.

WEB RESOURCES	
1.	https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html
2.	http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf
3.	https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_text.pdf

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Computer Networks
CSE, CSE(AI), CSE(AI&ML), CSE(DS), IT

Course Category	Professional Core	**Course Code**	20CS5T08
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Understand the basic taxonomy, terminology and architectures of the computer networks
2	Analyze the services, protocols and features of the various layers of computer networks.
3	Understand the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Enumerate the basic concepts of Computer Networks	K1
CO2	Analyze protocols implemented in Data Link Layer for error and flow control.	K4
CO3	Design applications using internet protocols.	K3
CO4	Implement routing and congestion control algorithms.	K3
CO5	Develop application layer protocols and understand socket programming.	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	1	2	2	0	0	0	0	1	0	3	3	0
CO2	3	3	3	3	2	3	0	0	0	0	3	0	3	3	0
CO3	3	2	2	1	1	3	0	0	0	0	1	0	3	2	0
CO4	3	3	3	3	3	0	0	0	0	0	0	0	3	3	0
CO5	3	3	3	3	3	0	0	0	0	0	0	0	3	3	0

COURSE CONTENT	
UNIT I	**Introduction:** Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History. **Physical Layer** –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.
UNIT II	**Data link layer:** Design issues, **Framing**: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one‘s complement internet checksum, services provided to Network Layer, **Elementary Data LinkLayer protocols**: simplex protocol, Simplex stop and wait, Simplex protocol for NoisyChannel. **Sliding window protocol:** One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.
UNIT III	**Media Access Control: Random Access**: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, **Controlled Access:**Reservation, Polling, Token Passing, **Channelization:** frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA). **Wired LANs:** Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.
UNIT IV	**The Network Layer Design Issues** – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices
UNIT V	**The Transport Layer:** Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services- TCP features-Segment- A TCP connection- windows in TCP- flow control-Error control, Congestion control in TCP. **Application Layer** –- World Wide Web: HTTP, Electronic mail-Architecture- web based mail- email security-TELENET-local versus remote Logging-Domain Name System: Name Space, DNS in Internet ,- Resolution-Caching- Resource Records- DNS messages-Registrars-security of DNS Name Servers, SNMP.

TEXT BOOKS	
1.	Computer Networks — Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2.	Data Communications and Networks – Behrouz A. Forouzan, Fifth Edition TMH.
REFERENCE BOOKS	
1.	Data Communications and Networks- Achut S Godbole, AtulKahate ,Second Edition ,McGraw Hill Education
2.	Computer Networks, Mayank Dave, CENGAGE, First Edition,2017
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106105081
2.	https://nptel.ac.in/courses/106105183

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Design and Analysis of Algorithms
CSE, CSE(AI), CSE(AI&ML), CSE(DS), IT

Course Category	Professional Core	**Course Code**	20CS5T09
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Able to interpret algorithms and their time complexity
2	Able to interpret Greedy and Divide and Conquer methods using algorithms
3	Able to solve backtracking and dynamic programming problems
4	Able to identify NP-Hard & NP-Complete classes

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms	K4
CO2	List and describe various algorithmic approaches and Solve problems using divide and conquer &greedy Method	K3
CO3	Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.	K3
CO4	Analyze design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches	K4
CO5	Demonstrate NP-Hard and NP-Complete classes, Cook's theorem	K2

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	2	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	2	3	-	-	-	-	-	-	-	-	-	3	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	3	-

COURSE CONTENT	
UNIT I	**Introduction:** Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, asymptotic notation, Randomized Algorithms.
UNIT II	**Divide and Conquer:** General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort. **The Greedy Method:** The general Method, knapsack problem, minimum-cost spanning Trees, Optimal Merge Patterns, Single Source Shortest Paths.
UNIT III	**Dynamic Programming:** The general method, multistage graphs, All pairs-shortest paths,optimal Binary search trees, 0/1 knapsack, The traveling salesperson problem.
UNIT IV	**Backtracking:** The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.
UNIT V	**P and NP problems:** Basic concepts, Class P, Fractional Knapsack problem in P, Class NP, Fractional Knapsack problem in NP **NP-Hard and NP-Complete problems:** Basic concepts, non-deterministic algorithms, NP -Hard and NP-Complete classes, Cook‘s theorem.

TEXT BOOKS	
1.	Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran, –Fundamentals of Computer Algorithms‖, 2nd Edition, Universities Press,2010.
2.	Introduction to Algorithms Thomas H. Cormen, PHI Learning,Fourth Edition 2020.
REFERENCE BOOKS	
1.	Harsh Bhasin, ―Algorithms Design & Analysis‖, Oxford University Press 2015.
2.	Horowitz E. Sahani S: –Fundamentals of Computer Algorithms‖, 2nd Edition, Galgotia Publications,2010
3.	S. Sridhar, –Design and Analysis of Algorithms‖, Oxford University Press,2014.
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/105/106105164/

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Data Warehousing and Data Mining
CSE

Course Category	Professional Core	**Course Code**	20CS5T10
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Able to justify the importance of Datawarehouse and Data Mining
2	Understand and implement data preprocessing and algorithms in data warehouses and data mining
3	Able to Differentiate Classification algorithms
4	Able to illustrate frequent itemsets to calculate profits
5	Able to Differentiate Clustering algorithms

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the importance of Data Warehousing, Data Mining and its functionalities and Design schema for real time data warehousing applications.	K3
CO2	Analyze the methods of data preprocessing	K4
CO3	Differentiate classification methods and their selection measures	K4
CO4	Evaluate frequent itemset by using Apriori and FP growth algorithm	K3
CO5	Identify and apply various clustering algorithm (with open source tools), interpret, evaluate and report the result	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	2	2	1	1	0	0	0	0	0	0	0	2	1	1
CO2	3	3	3	1	1	0	0	0	0	0	0	0	2	1	1
CO3	3	3	3	1	1	0	0	0	0	0	0	0	2	1	1
CO4	3	3	3	1	1	0	0	0	0	0	0	0	2	1	1
CO5	3	3	3	1	1	0	0	0	0	0	0	0	2	1	1

COURSE CONTENT	
UNIT I	**Data Warehousing and Online Analytical Processing:** Data Warehouse: Basic concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Introduction: Why and What is data mining, What kinds of data need to be mined and patterns can be mined, Which technologies are used, Which kinds of applications are targeted.
UNIT II	**Data Pre-processing:** An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.
UNIT III	**Classification:** Basic Concepts, General Approach to solving a classification problem,Decision Tree Induction: Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction, Visual Mining for Decision Tree Induction.
UNIT IV	**Association Analysis:** Problem Definition, Frequent Item set Generation, Rule Generation: Confident Based Pruning, Rule Generation in Apriori Algorithm, Compact Representation offrequent item sets, FP-Growth Algorithm.
UNIT V	**Cluster Analysis:** Overview, Basics and Importance of Cluster Analysis, Clusteringtechniques, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bi-secting K Means

TEXT BOOKS	
1.	Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier,2011.
2.	Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson,First Edition,2016.
REFERENCE BOOKS	
1.	Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning, First Edition,2013
2.	Data Mining: VikramPudi and P. Radha Krishna, Oxford Publisher,2009
3.	Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford ,First Edition,2014
4.	Arun K. Pujari, –Data Mining Techniques,‖ Universities Press, Fourth Edition,2016
WEB RESOURCES	
1.	http://onlinecourses.nptel.ac.in/noc18_cs14/preview
2.	http://onlinecourses.nptel.ac.in/noc17_mg24/preview
3.	http://www.saedsayad.com/data_mining_map.htm

Open Elective-I Renewable Energy Engineering

Course Category	Open Elective	**Course Code**	20EE5T13
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

5.

COURSE OBJECTIVES	
1	To study the solar radiation data, equivalent circuit of PV cell and its I-V & P-V characteristics
2	To understand the concept of Wind Energy Conversion & its applications
3	To study the principles of biomass and geothermal energy
4	To understand the principles of Ocean Thermal Energy Conversion (OTEC), motion of waves and power associated with it
5	To study the various chemical energy sources such as fuell cell and hydrogen energy along with their operation and equivalent circuit

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze solar radiation data, extra-terrestrial radiation, radiation on earth's surface and solar Energy Storage	K4
CO2	Illustrate the components of wind energy systems	K3
CO3	Illustrate the working of biomass, digesters and Geothermal plants	K3
CO4	Demonstrate the principle of Energy production from OTEC, Tidal and Waves	K3
CO5	Evaluate the concept and working of Fuel cells & MHD power generation	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program														
Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	1	-	-	1	-	-	-	-	1	2	2
CO2	3	2	1	1	-	-	1	-	-	-	-	1	2	2
CO3	3	1	1	1	-	-	1	-	-	-	-	1	2	2
CO4	3	1	1	1	-	-	1	-	-	-	-	1	2	2
CO5	3	1	1	1	-	-	1	-	-	-	-	1	2	2

COURSE CONTENT	
UNIT 1	**Solar Energy:** Introduction - Renewable Sources - prospects, Solar radiation at the Earth Surface - Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics - Solar Energy Collectors: Flat plate Collectors, concentrating collectors - Solar Energy storage systems and Applications: Solar Pond - Solar water heating - Solar Green house.
UNIT 2	**Wind Energy**: Introduction - basic Principles of Wind Energy Conversion, the natureof Wind - the power in the wind - Wind Energy Conversion - Site selection considerations - basic components of Wind Energy Conversion Systems (WECS) - Classification - Applications.
UNIT 3	**Biomass and Geothermal Energy:** **Biomass:** Introduction - Biomass conversion technologies - Photosynthesis, factors affecting Bio digestion - classification of biogas plants - Types of biogas plants - selection of site for a biogas plant **Geothermal Energy**: Introduction, Geothermal Sources – Applications - operational and Environmental problems.
UNIT 4	**Energy From oceans, Waves & Tides:** **Oceans:** Introduction - Ocean Thermal Electric Conversion (OTEC) – methods - prospects of OTEC in India. **Waves:** Introduction - Energy and Power from the waves - Wave Energy conversion devices. **Tides:** Basic principle of Tide Energy -Components of Tidal Energy.
UNIT 5	**Chemical Energy Sources:** **Fuel Cells**: Introduction - Fuel Cell Equivalent Circuit - operation of Fuel cell - typesof Fuel Cells - Applications. **Hydrogen Energy:** Introduction - Methods of Hydrogen production - Storage and Applications **Magneto Hydro Dynamic (MHD) Power generation:** Principle of Operation -Types.

TEXT BOOKS	
1	G.D.Rai, Non-Conventional Energy Sources, Khanna Publications, 2011
2	John Twidell & Tony Weir, Renewable Energy Sources, Taylor & Francis, 2013
REFERENCE BOOKS	
1	S.P.Sukhatme & J.K.Nayak, Solar Energy-Principles of Thermal Collection and Storage, TMH, 2011
2	John Andrews & Nick Jelly, Energy Science- principles, Technologies and Impacts, Oxford, 2nd edition, 2013
3	Shoba Nath Singh, Non- Conventional Energy Resources, Pearson Publications, 2015
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/121/106/121106014/
2	https://nptel.ac.in/courses/103/107/103107157/

Optimization Techniques

Course Category	Open Elective	**Course Code**	20ME5T29
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
To make the students learn about	
1	Classical optimization techniques
2	Numerical methods for optimization
3	Genetic algorithm and Genetic programming
4	Multi-Objective Genetic algorithm
5	Optimization in design and manufacturing systems

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze the Classical optimization techniques for single and multi-variable problems with and with and without constraints.	K4
CO2	Apply numerical methods for optimization of manufacturing related problems	K3
CO3	Apply the Principles of genetic algorithm and genetic programming to manufacturing related problems	K3
CO4	Analyze the Multi-Objective Genetic algorithm for industrial problems	K4
CO5	Solve engineering problems by using optimization techniques in design and manufacturing systems	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	2	1	-	-	-	-	-	-	-	2	1
CO2	2	3	2	2	1	-	-	-	-	-	-	1	2	1
CO3	2	3	2	2	1	-	-	-	-	-	-	1	2	1
CO4	2	3	2	2	1	-	-	-	-	-	-	1	2	1
CO5	2	3	2	2	1	-	-	-	-	-	-	1	2	1

COURSE CONTENT	
UNIT I	CLASSICAL OPTIMIZATION TECHNIQUES: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions, merits and demerits of classical optimization techniques.

UNIT II	NUMERICAL METHODS FOR OPTIMIZATION: Nelder Mead‘s Simplex search method, Gradient of a function, Steepest descent method, Newton‘s method, Pattern search methods, conjugate method, types of penalty methods for handling constraints, advantages of numerical methods.
UNIT III	GENETIC ALGORITHM (GA): Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization,draw backs of GA. GENETIC PROGRAMMING (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.
UNIT IV	MULTI-OBJECTIVE GA: Pareto‘s analysis, non-dominated front, multi – objective GA, Non-dominated sorted GA, convergence criterion, applications of multi-objective problems.
UNIT V	APPLICATIONS OF OPTIMIZATION IN DESIGN AND MANUFACTURING SYSTEMS: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, optimization of springs and gears, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

TEXT BOOKS

1.	Engineering Optimization Theory & Practice, Singiresu S. Rao New Age International Publishers,Ltd.
2.	Optimization for Engineering Design, Kalyanmoy Deb, PHI Publishers.

REFERENCE BOOKS

1.	Genetic algorithms in Search, Optimization, and Machine learning, D.E.Goldberg, Addison-WesleyPublishers
2.	Multi objective Genetic algorithms, Kalyanmoy Deb, PHI Publishers
3.	Optimal design, Jasbir Arora, Mc Graw Hill (International) Publishers
4.	Optimum Design of Mechanical Elements, Ray C. Johnson, John Wiley & sons, Inc., New York.

WEB REFERENCES

1.	https://nptel.ac.in/courses/111/105/111105039/
2.	https://nptel.ac.in/courses/106/108/106108056/
3.	https://nptel.ac.in/courses/112/105/112105235/
4.	https://onlinecourses.nptel.ac.in/noc21_me43/preview
5.	https://www.nptel.ac.in/content/syllabus_pdf/112103301.pdf

Principles of Communication Engineering

Course Category	Open Elective	**Course Code**	20EC5T15
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn	
1	The Fundamentals of Analog Communication Systems
2	The Generation and Detection of Angle Modulation Techniques
3	The Digital Modulation Techniques
4	The knowledge in measurement of information and various codes for communication systems
5	Fundamentals of Microwave, Satellite, Optical and Mobile Communications

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basics of Analog communication system	K2
CO2	Understand the Angle Modulation Techniques	K2
CO3	Understand the basics of Analog communication system	K2
CO4	Apply the knowledge of digital electronics and understand the error control coding techniques.	K3
CO5	Understand different types of communication systems and its requirements.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT

UNIT I	**Basic blocks of Communication System**. Analog Modulation-Principles of Amplitude Modulation, DSBSC, SSB-SC and VSB-SC, AM transmitters and receivers
UNIT II	**Angle Modulation-Frequency and Phase Modulation**. Transmission Band width of FM signals, Methods of generation and detection, FM Transmittersand Receivers.
UNIT III	**Sampling theorem, Pulse Modulation Techniques**-PAM, PWM and PPM concept ,PCM System, Delta Modulation, Digital Modulation Techniques-(ASK, FSK, PSK, QPSK).
UNIT IV	**Error control coding techniques**–Basics of Information Theory, Linear block codes-Encoder and decoder, Hamming Code, Cyclic codes–Encoder, Syndrome Calculator, Convolution codes.
UNIT V	Modern Communication Systems–Microwave communication systems, Optical communication system, Satellite communication system, Mobile communication system.

TEXT BOOKS	
1	Communication Systems (Analog And Digital) | Sanjay Sharma, S.K.Kataria& Sons, 2013
2	CommunicationSystems,SimonHaykins,JohnWiley,3rdEdition,1995
REFERENCE BOOKS	
1	Shulin Daniel, _Error Control Coding‘, Pearson, 2ndEdition,2011.
2	B.P.Lathi and ZhiDing, _Modern Digital and Analog Communication Systems‘, OUPUSA Publications, 4thEdition,2009.
WEB RESOURCES	
1	https://nptel.ac.in/courses/117105143/15
2	http://www.nptelvideos.in/2012/12/digital-communication.html

Entrepreneurship

Course	Open Elective	**Credits**	20HM5T03
Course Type	Theory	**Lecture-Tutorial-Practice**	3 -0 -0
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
On successful completion of the course, the student will be able to		
CO 1	Understand different Entrepreneurial traits.	K2
CO 2	Identify and compare the financial institutions supporting entrepreneurship.	K4
CO 3	Understand the functioning and problems faced by MSMEs (Micro Small Medium Enterprises)	K2
CO 4	Identify Entrepreneurial opportunities for women.	K3
CO 5	Analyze different market, technical factors and prepare a project report based on guidelines.	K4

Contribution of Course Outcomes towards achievement of Program

Outcomes: 1 – Low, 2 - Medium, 3 – High

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	0	0	0	0	0	1	0	3	2	1	3	3	-	-	-
CO2	0	0	0	0	0	1	0	3	0	2	3	1	-	-	-
CO3	0	0	0	0	0	1	1	3	1	1	0	3	-	-	-
CO4	0	0	0	0	0	1	0	3	1	1	0	3	-	-	-
CO5	0	1	1	0	0	1	2	3	1	3	3	3	-	-	-

COURSE CONTENT	
UNIT I	**Introduction to Entrepreneurship** Introduction to Entrepreneurship: Definition of Entrepreneur Entrepreneurial Traits. Entrepreneur vs. Manager, Creating and Starting the venture: Sources of new ideas, methods of generating ideas, creative problem solving – Writing Business Plan, Evaluating Business Plans.
UNIT II	**Institutional and financial support to Entrepreneurship** Institutional/financial support: Schemes and functions of Directorate of Industries, IFCI, District Industries Centers (DICs), Industrial Development Corporation (IDC), State Financial Corporation (SFCs), Small Scale Industries Development Corporations (SSIDCs). Khadi and Village Industries Commission (KVIC), Technical Consultancy Organization (TCO), Small Industries Service Institute (SISI), National Small Industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI).(short answers only), Start up culture.
UNIT III	**Micro, Small and Medium Enterprises**: Importance and role of MSMEs in economic development, Types of MSMEs, Policies andtheir support to MSMEs growth and growth strategies. Sickness in small business and remedies – small entrepreneurs in International business.
UNIT IV	**Women Entrepreneurship and Start up Culture** Role & importance, profile of women Entrepreneur, problems of women Entrepreneurs, women Entrepreneurship Development in India - Steps taken by the Government to promote women entrepreneurship in India, Associations supporting women entrepreneurs. Successful Entrepreneurs (case studies).
UNIT V	**Project Formulation and Appraisal** Preparation of Project Report –Content; Guidelines for Report preparation – Project Appraisal techniques –economic – Steps Analysis; Financial Analysis; Market Analysis; Technical Feasibility.

TEXT BOOKS	
1.	Vasanth Desai – Fundamentals of Entrepreneurship and Small business management – Himalaya publishing house – 2019
2.	Robert Hisrich, Michael Peters, Dean A. Sheperd, Sabyasachi Sinha – Entrepreneurship - TMH - 2020.
REFERENCE BOOKS	
1.	Vasant Desai – Entrepreneurship Management - Himalaya Publishing House- 2018.
2.	Robert J.Calvin - Entrepreneurial Management – TMH - 2009.
3.	Gurmeet Naroola - The entrepreneurial Connection – TMH - 2009.
4.	Aruna Kaulgud - Entrepreneurship Management - Vikas publishing house - 2009.
WEB REFERENCES	
1.	https://nptel.ac.in/courses/110105067/50
2.	http://www.yourarticlelibrary.com/project-management/5-methods-of-project-appraisal-explained/40771
3.	https://springhouse.in/government-schemes-every-entrepreneur/

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Professional Elective-I
Human Computer Interaction
CSE

Course Category	Professional Elective	**Course Code**	20CS5T11
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Understand the theoretical dimensions of human factors involved in the acceptance of computer interfaces.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Compare the capabilities of both humans and computers from the viewpoint of human information processing	K4
CO2	Understand various types of menu options	K2
CO3	Understand different types of interaction devices	K2
CO4	Applying quality techniques in computer interaction	K3
CO5	Applying various searching and filtering methods	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	2	-	-	-	-	-	-	-	-	-	-	2	1
CO2	2	1	1	2	2	-	-	-	-	-	-	-	1	2	1
CO3	2	1	1	2	1	-	-	-	-	-	-	-	1	2	-
CO4	2	1	1	2	1	-	-	-	-	-	-	-	1	2	2
CO5	2	1	2	2	2	-	-	-	-	-	-	-	1	2	-

COURSE CONTENT	
UNIT I	**Introduction:** Usability of Interactive Systems- introduction, usability goals and measures,usability motivations, universal usability, goals for our profession **Managing Design Processes:** Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories
UNIT II	**Menu Selection, Form Fill-In and Dialog Boxes:** Introduction, Task- Related MenuOrganization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data entry with Menus: Form Fill-in, dialog Boxes, andalternatives, Audio Menus and menus for Small Displays
UNIT III	**Command and Natural Languages:** Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in Computing **Interaction Devices:** Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large
UNIT IV	**Quality of Service:** Introduction, Models of Response-Time impacts, Expectations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences **Balancing Function and Fashion:** Introduction, Error Messages, Non anthropomorphic Design, Display Design, WebPage Design, Window Design, Color
UNIT V	**Information Search:** Introduction, Searching in Textual Documents and DatabaseQuerying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces **Information Visualization:** Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization

TEXT BOOKS	
1.	Designing the User Interface, Strategies for Effective Human Computer Interaction, 5ed, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven M Jacobs, Pearson Sixth Edition 2017
2.	The Essential guide to user interface design,2/e, Wilbert O Galitz, Wiley DreamaTech Third Edition 2007
REFERENCE BOOKS	
1.	Human Computer, Interaction Dan R.Olsan, Cengage , First Edition 2010.
2.	Designing the user interface. 6/e, Ben Shneidermann , PEA,2014.
3.	User Interface Design, Soren Lauesen , PEA,2004.
4.	Interaction Design PRECE, ROGERS, SHARPS, Wiley, 5th Edition,2019.
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106103115

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Software Project Management
CSE, CSE(AI), CSE(AI&ML), CSE(DS)

Course Category	Professional Elective	**Course Code**	20CS5T12
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
2	To compare and differentiate organization structures and project structures
3	To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Apply the process to be followed in the software development life-cycle models	K3
CO2	Apply the concepts of project management & planning	K3
CO3	Develop the project plans through managing people, communications and change	K3
CO4	Conduct activities necessary to successfully complete and close the Software projects	K2
CO5	Implement communication, modeling, and construction & deployment practices in software development	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	1	1	3	-	-	1	2	2	3	2	2	2	3
CO2	1	2	2	2	1	-	-	1	2	2	3	2	2	2	2
CO3	1	1	2	1	2	-	-	1	2	2	3	2	1	2	3
CO4	1	2	2	2	1	-	-	1	2	2	3	2	3	1	2
CO5	1	2	1	2	3	-	-	1	2	2	3	2	3	2	3

COURSE CONTENT	
UNIT I	**Conventional Software Management:** The waterfall model, conventional software Management performance. **Evolution of Software Economics:** Software Economics, pragmatic software cost estimation. **Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections. **The old way and the new:** The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.
UNIT II	**Life cycle phases:** Engineering and production stages, inception, Elaboration, construction, transition phases. **Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.
UNIT III	**Model based software architectures:** A Management perspective and technical perspective. **Work Flows of the process:** Software process workflows, Iteration workflows. **Checkpoints of the process: Major** mile stones, Minor Milestones, Periodic statusassessments. **Iterative Process Planning:** Work breakdown structures, planning guidelines, cost andschedule estimating, Iteration planning process, Pragmatic planning.
UNIT IV	**Project Organizations and Responsibilities:** Line-of-Business Organizations, Project Organizations, evolution of Organizations. **Process Automation:** Automation Building blocks, The Project Environment. **Project Control and Process instrumentation:** The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.
UNIT V	Agile Methodology, ADAPTing to Scrum, Patterns for Adopting Scrum, Iterating towards Agility. **Fundamentals of DevOps**: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

TEXT BOOKS	
1.	Software Project Management, Walker Royce, PEA, 2005.
2.	Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.7/e 2013.
REFERENCE BOOKS	
1.	The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in
	Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
2.	Software Project Management, Bob Hughes,6/e, Mike Cotterell, TMH,2017
3.	Software Project Management, Joel Henry, PEA,2003
4.	Software Project Management in practice, Pankaj Jalote, PEA, 2005
5.	Effective Software Project Management, Robert K.Wysocki, Wiley,2006
6.	Project Management in IT, Kathy Schwalbe, Cengage,Third Edition 2004
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/105/106105218/

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Distributed Systems
CSE, CSE(AI), CSE(AI&ML), CSE(DS), IT

Course Category	Professional Elective	**Course Code**	20CS5T13
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To understand the foundations of distributed systems
2	To learn issues related to clock Synchronization and the need for global state in distributed systems
3	To learn distributed mutual exclusion and deadlock detection algorithms
4	To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
5	To learn the characteristics of peer-to-peer and distributed shared memory systems

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the foundations and issues of distributed systems	K2
CO2	Illustrate the various synchronization issues and global state for distributed systems	K2
CO3	Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems	K2
CO4	Describe the agreement protocols and fault tolerance mechanisms in distributed systems	K2
CO5	Describe the features of peer-to-peer and distributed shared memory systems	K2

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	2	2	-	-	-	-	-	-	-	-	3	2	-
CO2	2	3	1	2	-	-	-	-	-	-	-	-	3	2	-
CO3	2	3	1	2	-	-	-	-	-	-	-	-	3	2	-
CO4	3	1	3	2	-	-	-	-	-	-	-	-	3	2	-
CO5	2	1	2	2	-	-	-	-	-	-	-	-	3	2	-

COURSE CONTENT	
UNIT I	Distributed Systems: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions,Design issues andchallenges. A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Modelsof process communications. Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.
UNIT II	Message Ordering & Snapshots: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.
UNIT III	Distributed Mutex & Deadlock: Distributed mutual exclusion algorithms: Introduction, Preliminaries, Lamport_s algorithm, Ricart-Agrawala algorithm, Maekawa_s algorithm,Suzuki–Kasami_s broadcast algorithm. Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Knapp_s classification, Algorithms forthe single resource model, the AND model and the OR model.
UNIT IV	Recovery & Consensus: Check pointing and rollback recovery: Introduction, Background and definitions, Issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, Coordinated check pointing algorithm, Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition, Overview of results, Agreement in a failure, free system, Agreement in synchronous systems with failures.
UNIT V	Peer-to-peer computing and overlay graphs: Introduction, Data indexing and overlays,Chord – Content addressable networks, Tapestry. Distributed shared memory: Abstraction and advantages, Memory consistency models, Sharedmemory Mutual Exclusion.

TEXT BOOKS	
1.	Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg,Fifth Edition, Pearson Education, 2012.
2.	Distributed Computing: Principles, algorithms, and systems, Ajay Kshemkalyani and MukeshSinghal, Cambridge University Press,First Edition 2011.
REFERENCE BOOKS	
1.	Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall ofIndia,2007.
2.	Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri,McGraw-Hill, 2017.
3.	Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,Pearson Education, 2007.
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/106/106106168/

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Advanced Unix Programming
CSE, IT

Course Category	Professional Elective	**Course Code**	20IT5T09
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES
The objective of the course is to

1	Understating the shell commands, shell programming, system calls of files and processes,signals, inter-process communication concepts and programming, TCP and UDP.

COURSE OUTCOMES		**Cognitive level**
Upon successful completion of the course, the student will be able to:		
CO1	Gain good knowledge on Unix commands and awareness of shell programming	K1
CO2	Know about different system calls for files and directories	K2
CO3	Ability to know the working of processes and signals	K2
CO4	Application of client server program for IPC	K3
CO5	Knowledge about socket programming	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	2	-	-	-	-	-	-	-	2	2	-
CO2	2	2	2	2	2	-	-	-	-	-	-	-	-	3	-
CO3	2	3	-	3	3	-	-	-	-	-	-	-	-	3	-
CO4	2	3	-	3	3	-	-	-	-	-	-	-	-	3	-
CO5	3	3	2	3	3	-	-	-	-	-	-	-	-	3	-

COURSE CONTENT

UNIT I	Introduction, Architecture of Unix, Responsibilities of shell, Unix file system, vi editor. **Unix commands**: Some Basic Commands, file utilities, process utilities, text processing utilities, network utilities, disk utilities, backup utilities, Security by file permissions.
UNIT II	**Shell Programming**: shell variables, The Export command, The Profile File a Script Run During starting, The First Shell Script, The read command, Positional Parameters, The $? Variable, Knowing the exit Status- More about the Set Command, The Exit command, Branching Control Structures, Loop Control Structures, The Continue and Break Statement- The Expr Command, Performing Integer Arithmetic- Real Arithmetic in Shell Programs- The here Document(<<), The Sleep Command, Debugging Scripts, The Script command, The Eval command, The Exec Command, Sample programs. **Files** - Introduction, file descriptors, open, creat, read, write, close, lseek, dup2, file status information-stat family, file and record locking - fcntl function, file permissions - chmod, fchmod, file ownership - chown, lchown, links-soft and hard links - symlink, link, unlink.
UNIT III	**Directories-**Creating, removing and changing Directories-mkdir, rmdir, chdir, obtaining current working directory - getcwd, Directory contents, Scanning Directories-opendir, readdir, closedir, rewinddir functions. **Process Control**: process identifiers, fork function, vfork function, exit function, wait and waitpid functions, exec functions, user identification. **Signals**: signal handling using signal function, kill and raise, alarm, pause, abort and sleep functions.
UNIT IV	**IPC**: introduction, pipes, FIFO‘s, client –server examples for pipes and FIFO‘s **message queues:** message queue structure in kernel, system calls of message queue, client-server example for message queue. **Semaphores:** definition, system calls of semaphores, semaphoresstructure in kernel, file locking using semaphores
UNIT V	**Shared memory**-system calls of shared memory, semaphore structure in kernel, client server example. **Sockets:** Introduction, overview, elementary socket system calls, TCP Echo program, UDP Echo program

TEXT BOOKS	
1.	Unix the ultimate guide, 3rd edition, Sumitabha Das, TMH.
2.	Advanced programming in the Unix environment, W. Richard Stevens.
3.	Unix network programming, W. Richard Stevens.
REFERENCE BOOKS	
1.	Introduction to Unix and shell programming, Venkatesh murthy
2.	Unix and shell programming, B.M. Harwani, OXFORD university press.

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Data Warehousing and Data Mining Laboratory
CSE

Course Category	Program Core	**Course Code**	20CS5L08
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	Inculcate Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment
2	Design a data warehouse or data mart to present information needed by management in a form that is usable
3	Emphasize hands-on experience working with all real data sets
4	Test real data sets using popular data mining tools such as WEKA, Python Libraries
5	Develop ability to design various algorithms based on data mining tools

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Design a data mart or data warehouse for any organization	K3
CO2	Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification for realistic data	K3
CO3	Implement and Analyze on knowledge flow application on data setsand Apply the suitable visualization techniques to output analytical results	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	2	3	1	1	-	-	-	-	-	-	-	1	1	-
CO2	3	3	3	1	1	-	-	-	-	-	-	-	1	2	-
CO3	3	3	3	1	1	-	-	-	-	-	-	-	1	2	-

COURSE CONTENT

Software Requirements: WEKA Tool/Python/R-Tool/Rapid Tool/Oracle Data mining

List of Experiments

1	Creation of a Data Warehouse. ➢ Build Data Warehouse/Data Mart (using open source tools like Pentaho Data Integration Tool, Pentaho Business Analytics; or other data warehouse tools like Microsoft-SSIS, Informatica, Business Objects,etc.,) ➢ Design multi-dimensional data models namely Star, Snowflake and Fact Constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, manufacturing, Automobiles, sales etc). ➢ Write ETL scripts and implement using data warehouse tools. ➢ Perform Various OLAP operations such slice, dice, roll up, drill up and pivot
2	Explore machine learning tool –WEKA‖ ➢ Explore WEKA Data Mining/Machine Learning Toolkit. ➢ Downloading and/or installation of WEKA data mining toolkit. ➢ Understand the features of WEKA toolkit such as Explorer, Knowledge Flowinterface, Experimenter, command-line interface. ➢ Navigate the options available in the WEKA (ex. Select attributes panel, Preprocesspanel, Classify panel, Cluster panel, Associate panel and Visualize panel) ➢ Study the arff file format Explore the available data sets in WEKA. Load a data set(ex. Weather dataset, Iris dataset, etc.)

	➢ Load each dataset and observe the following: 1. List the attribute names and they types 2. Number of records in each dataset 3. Identify the class attribute (if any) 4. Plot Histogram 5. Determine the number of records for each class. 6. Visualize the data in various dimensions
3	Perform data preprocessing tasks and Demonstrate performing association rule mining on datasets ➢ Explore various options available in Weka for preprocessing data and applyUnsupervised filters like Discretization, Resample filter, etc. on each dataset ➢ Load weather. nominal, Iris, Glass datasets into Weka and run AprioriAlgorithm with different support and confidence values. ➢ Study the rules generated. Apply different discretization filters on numerical attributesand run the Apriori association rule algorithm. Study the rules generated. ➢ Derive interesting insights and observe the effect of discretization in the rulegeneration process.
4	Demonstrate performing classification on data sets ➢ Load each dataset into Weka and run 1d3, J48 classification algorithm. Study theclassifier output. Compute entropy values, Kappa statistic. ➢ Extract if-then rules from the decision tree generated by the classifier, Observe the
	confusion matrix. ➢ Load each dataset into Weka and perform Naïve-bayes classification and k-Nearest Neighbour classification. Interpret the results obtained. ➢ Plot RoC Curves ➢ Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.
5	Demonstrate performing clustering of data sets ➢ Load each dataset into Weka and run simple k-means clustering algorithm withdifferent values of k (number of desired clusters). ➢ Study the clusters formed. Observe the sum of squared errors and centroids, and deriveinsights. ➢ Explore other clustering techniques available in Weka. ➢ Explore visualization features of Weka to visualize the clusters. Derive interestinginsights and explain.
6	Demonstrate knowledge flow application on data sets ➢ Develop a knowledge flow layout for finding strong association rules by usingApriori, FP Growth algorithms ➢ Set up the knowledge flow to load an ARFF (batch mode) and perform a crossvalidation using J48 algorithm ➢ Demonstrate plotting multiple ROC curves in the same plot window by using j48 andRandom forest tree
7	Demonstrate ZeroR technique on Iris dataset (by using necessary preprocessing technique(s))and share your observations
8	Write a java program to prepare a simulated data set with unique instances.
9	Write a Python program to generate frequent item sets / association rules using Apriori algorithm
10	Write a program to calculate chi-square value using Python. Report your observation.
11	Write a program of Naive Bayesian classification using Python programming language.
12	Implement a Java program to perform Apriori algorithm
13	Write a program to cluster your choice of data using simple k-means algorithm using JDK
14	Write a program of cluster analysis using simple k-means algorithm Python programming language.
15	Write a program to compute/display dissimilarity matrix (for your own dataset containing at least four instances with two attributes) using Python
16	Visualize the datasets using matplotlib in python.(Histogram, Box plot, Bar chart, Pie chart etc.,)

Computer Networks Laboratory

CSE, CSE(AI), CSE(AI&ML), CSE(DS), IT

Course Category	Program Core	**Course Code**	20CS5L09
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	Learn basic concepts of computer networking and acquire practical notions of protocols withthe emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture andhow do some important protocols work

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Develop various data link layer functionalities	K3
CO2	Analyze and identify appropriate routing algorithm for the network	K4
CO3	Analyze the network simulations in NS2	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	2	0	0	0	0	0	0	0	2	3	0
CO2	3	3	3	3	2	0	0	0	0	0	0	0	2	3	0
CO3	3	3	3	3	2	0	0	0	0	0	0	0	2	3	0

COURSE CONTENT	
List of Experiments	
1	Study of Network devices in detail and connect the computers in Local Area Network.
2	Write a Program to implement the data link layer farming methods such as i) Character stuffing ii) bit stuffing.
3	Write a Program to implement data link layer farming method checksum.
4	Write a program for Hamming Code generation for error detection and correction.
5	Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
6	Write a Program to implement Sliding window protocol for Goback N.
7	Write a Program to implement Sliding window protocol for Selective repeat.
8	Write a Program to implement Stop and Wait Protocol.
9	Write a program for congestion control using leaky bucket algorithm
10	Write a Program to implement Dijkstra_s algorithm to compute the Shortest path through a graph.
11	Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).
12	Write a Program to implement Broadcast tree by taking subnet of hosts.
13	Wireshark i. Packet Capture Using Wire shark ii. Starting Wire shark iii. Viewing Captured Traffic iv. Analysis and Statistics & Filters.
14	Execution of Nmap scan
15	Operating System Detection using Nmap
16	Do the following using NS2 Simulator i. NS2 Simulator-Introduction ii. Simulate to Find the Number of Packets Dropped iii. Simulate to Find the Number of Packets Dropped by TCP/UDP iv. Simulate to Find the Number of Packets Dropped due to Congestion v. Simulate to Compare Data Rate& Throughput.

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Skill Oriented Course-III
Animation Course: Animation Design
CSE

Course Category	Skill Oriented	**Course Code**	20CS5S06
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Total Marks**	50

COURSE OBJECTIVES	
1	To understand 2-D and 3-D animation using Adobe package

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Apply the tools to create 2D animation for films and videos	K3
CO2	Analyze different styles and treatment of content in 3D model creation	K4
CO3	Apply tools to create effective 3D modeling texturing and lighting	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2	2	-	-	-	-	-	-	-	3	3	-
CO2	3	2	2	2	2	-	-	-	-	-	-	-	3	3	-
CO3	3	2	2	2	2	-	-	-	-	-	-	-	3	3	-

COURSE CONTENT	
List of Experiments	
1	Adobe Photoshop: a. Create your visiting card b. Create Title for any forthcoming film
2	Draw Cartoon Animation using reference
3	Creating Frame by Frame animation
4	Create a scene by using Mask layers animation
5	Adobe Illustrator: Packet Design(Toothpaste packet, Soap cover, any Food product)
6	Create any model of the male or female character
7	Create any Model of Cars or Bike
8	Create any Model of any animal
9	Create any Model of any birds, fishes, and worms
10	Create and Convert 2D objects into 3D objects
11	Create an animated 3D titling with sound
12	Create any Model some objects such as chairs, tables, fruits, utensils
List of Augmented Experiments: (Weeks 13 – Week 16) (Any two of the following experiments can be performed	
13	Animate day and night scene of a street with the help of lighting
14	Create a human character using Character studio and animate the same
15	Create a natural outdoor or indoor scene
16	Apply texture on various objects and characters

TEXT BOOKS	
1.	Flash MX 2004, Thyagharajan Anbumani, TMH, First Edition 2005.
2	Brian Underdahl, The Complete Reference – Macromedia Flash Mx2004, 2nd edition – TMH
WEB RESOURCES	

1.	https://onlinecourses.swayam2.ac.in/cec21_cs07/preview
2.	https://onlinecourses.swayam2.ac.in/ugc19_cs09/preview
3.	https://onlinecourses.swayam2.ac.in/ntr20_ed15/preview
4.	https://youtube.com/playlist?list=PLfFk8y2fd3FjeE_CrFASNvDLBp3yF1Hwi

Continuous Integration and Continuous Delivery using DevOps

CSE, IT

Course Category	Skill Oriented	**Course Code**	20IT5S05
Course Type	Laboratory	**L-T-P-C**	1-0-2-2
Prerequisites		**Total Marks**	**50**

COURSE OBJECTIVES
The objectives of the course is to

1	To understand the concept of DevOps with associated technologies and methodologies.
2	To be familiarized with Jenkins, which is used to build & test software Applications &Continuous integration in Devops environment.

COURSE OUTCOMES		**Cognitive level**
Upon successful completion of the course, the student will be able to:		
CO1	Remember the importance of DevOps tools used in software development lifeCycle	K1
CO2	Understand the importance of Jenkins to Build, Deploy and Test Software Applications	K2
CO3	Examine the test results of a java program in Jenkins	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	3	-	-	-	-	-	-	-	0	3	2
CO2	1	1	2	1	3	-	-	-	-	-	-	-	0	3	2
CO3	1	1	2	1	3	-	-	-	-	-	-	-	0	3	2

COURSE CONTENT	
0	**Prerequisite:** To Understand the Concept of DevOps with related technologies which areused to Code, Build, Test, Configure & Monitor the Software Applications.
1	Installation of Jenkins
2	Configuration of Jenkins i.e. creating a first admin user and installing required plugins.
3	To Create a Freestyle project in Jenkins to test, and deploy Java or Web
	Applications using Netbeans or eclipse.
4	To Create a Pipeline project in Jenkins to test, and deploy Java or Web Applications usingNetbeans or eclipse.
5	To do Source code management from GIT in Jenkins while developing a Java application
6	To do a Controller test in Jenkins while developing a Java application

TEXT BOOKS	
1.	John Ferguson Smart, –Jenkins, The Definitive Guide‖, O'Reilly Publication.
2.	Learn to Master DevOps by StarEdu Solutions.

REFERENCE BOOKS	
1.	Sanjeev Sharma and Bernie Coyne, –DevOps for Dummies‖, Wiley Publication
2.	Httermann, Michael, ―DevOps for Developers‖, A press Publication.
3.	Joakim Verona, –Practical DevOps‖, Pack publication

WEB RESOURCES	
1.	https://www.udacity.com/course/intro-to-devops--ud611 - Good online course with sample exercises.
2.	http://www.edureka.co/devops - Online Training covering high level process and tools. (Needs Registration)
3.	https://www.edx.org/course?search_query=devops – Has no. of courses from MS and Redhat.
4.	https://www.codementor.io/devops/tutorial - Basic Tutorial on DevOps.

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Employability Skills-I

Course Category	Mandatory Course	**Course Code**	20HE5T02
Course Type	Theory	**L-T-P-C**	2 –0 – 0-0
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	0 0 0

COURSE OBJECTIVE:	
1	To get employment in corporate world.

COURSE OUTCOMES		**LEVEL**
Upon successful completion of the course, the student will be able to:		
CO1	Enables the student to be aware of integrated word building to use in communication.	**K -I**
CO2	Grooms the learner in their mental flexibility to be fit in team for an organization.	**K –II**
CO3	Strengthens in syntactic construction of the language.	**K -II**
CO4	Empowers the learner in the language comprehension skills.	**K -II**
CO5	Assists the learner to present academic and professional abilities through writing skills.	**K-I**

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	0	0	0	0	0	0	0	0	0	2	0	0
CO2	0	0	0	0	0	0	0	0	2	0	0	0
CO3	0	0	0	0	0	0	0	0	0	1	0	0
CO4	0	0	0	0	0	0	0	0	0	1	0	1
CO5	0	0	0	0	0	0	0	0	0	1	0	0

COURSE CONTENT	
UNIT I	**Vocabulary building /Language fluency.** Connotations - Synonyms and Antonyms - Prefix and Suffix - Phrasal Verbs – Collocations.
UNIT II	**Attitude/ Team Building** Types of attitudes – Positive attitude – Importance of team work- advantages of team work.
UNIT III	**Sentence Completion** Restatement – Comparison – Contrast - Cause and effect
UNIT IV	**Reading comprehension** Literal Comprehension - Interpretative Comprehension - Applied Comprehension - Affective Comprehension
UNIT V	**Resume Writing** Chronological resume - Functional resume

TEXT BOOKS	
1.	Soft Skills - Enhancing Employability: Connecting Campus with Corporate by M. S. RaoI K International Publishing House Pvt. Ltd.
2.	Enhancing Employability @ Soft Skills by Shalini Verma Pearson Education.
3.	Soft Skills at Work: Technology for Career Success: 0 by Beverly Amer
4.	Resume To HR Interview Prep (Employability Enhancement Series) by Rajesh Vartak
WEB RESOURCES	
1.	https://www.twinkl.co.uk/search?q=employability
2.	https://www.realityworks.com/product/online-employability-skills-programs/
3.	https://connectingcredentials.org/resources/interactive-employability-skills-framework/
4.	https://oklahoma.gov/careertech/educators/resource-center/employability-and-adult-basic-education-resources.html
5.	https://barclayslifeskills.com/educators

Artificial Intelligence
Honors in CSE

Course Category	Honors in CSE	**Course Code**	20CS5H02
Course Type	Theory	**L-T-P-C**	4-0-0-4
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Know the methodology of Problem solving
2	Implement basic AI algorithms
3	Design and carry out an empirical evolution of different algorithms on a problem formalization

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the fundamental concepts in Artificial Intelligence	K2
CO2	Analyze the applications of search strategies and problem reductions	K4
CO3	Apply the mathematical logic concepts	K3
CO4	Develop the Knowledge representations in Artificial Intelligence	K3
CO5	Understand the Fuzzy logic systems	K2

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	3	-	-	-	-	-	-	-	2	2	3	2
CO2	3	2	1	3	2	-	-	-	-	-	-	3	2	3	1
CO3	3	2	2	3	2	-	-	-	-	-	-	2	2	2	2
CO4	3	2	1	3	1	-	-	-	-	-	-	3	2	2	2
CO5	3	1	2	3	-	-	-	-	-	-	-	2	2	2	2

COURSE CONTENT	
UNIT I	**Introduction to artificial intelligence:** Introduction ,history, intelligent systems, foundationsof AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.
UNIT II	**Problem solving: state-space search and control strategies:** Introduction, general problemsolving, characteristics of problem **Search Strategies:** exhaustive searches, heuristic search techniques, iterative-deepening A*, constraint satisfaction
UNIT III	**Logic concepts:** Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, predicate logic
UNIT IV	**Knowledge representation:** Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR **Advanced knowledge representation techniques:** Introduction, conceptual dependency theory, script structure.
UNIT V	**Expert system and applications:** Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truthmaintenance systems, application of expert systems, list of shells and tools.

TEXT BOOKS	
1.	Artificial intelligence, A modern Approach , 2nd ed, Stuart Russel, Peter Norvig, PEA
2.	Artificial Intelligence, Rich, Kevin Knight, Shiv Shankar B Nair, 3rd ed, TMH
REFERENCE BOOKS	
1.	Artificial Intelligence, Saroj Kaushik, CENGAGE Learning
2.	Introduction to Artificial Intelligence, Patterson, PHI
3.	Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA
4.	Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
5.	Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier
WEB RESOURCES	
1.	https://onlinecourses.nptel.ac.in/noc22_cs56/preview
2.	https://onlinecourses.swayam2.ac.in/cec21_cs08/preview

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Computer Science and Engineering

Software Engineering$Minors in CSE

Course Category	Minors in CSE	**Course Code**	20CS5M02
Course Type	Theory	**L-T-P-C**	3-0-2-4
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agileprocess
2	Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
3	Give exposure to Software Design techniques

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Ability to transform an Object-Oriented Design into high quality, executable code	K3
CO2	Skills to design, implement, and execute test cases at the Unit and Integration level	K3
CO3	Compare conventional and agile software methods	K4
CO4	Skills to design Software Architectural components.	K3
CO5	Analyze the interface analysis and Testing strategies	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	-	3	-	-	-	-	-	-	-	1	-	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	1	2	-	-
CO3	3	2	3	2	-	-	-	-	2	-	-	2	3	-	3
CO4	3	2	2	3	-	-	-	-	2	-	-	2	3	3	3
CO5	3	3	2	3	-	-	-	-	2	-	-	3	3	3	3

COURSE CONTENT	
UNIT I	The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology
UNIT II	Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.
UNIT III	Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.
UNIT IV	Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.
UNIT V	The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, Elements of Software Qualtiy Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

LABORATORY COURSE CONTENT	
List of Experiments	
Perform the following, for the following experiments (1-4): i. Do the Requirement Analysis and PrepareSRS ii. Draw E-R diagrams, DFD, CFD and structured charts for the project.	
1	Course Registration System
2	Students Marks Analyzing System
3	Online Ticket Reservation System
4	Stock Maintenance
5	Consider any application, using COCOMO model, estimate the effort
6	Consider any application, Calculate effort using FP oriented estimation model.
7	Draw the UML Diagrams for the problem 1,2, 3, 4.
8	Design the test cases for e-Commerce application (Flipcart, Amazon)
9	Design the test cases for a Mobile Application (Consider any example from Appstore)
10	Design and Implement ATM system through UML Diagrams.

TEXT BOOKS	
1.	Software Engineering a practitioner_s approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education
2.	Software Engineering, Ian Sommerville, Ninth Edition, Pearson.
REFERENCE BOOKS	
1.	Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2.	Software Engineering, Ugrasen Suman, Cengage.
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/105/106105182/
2.	https://nptel.ac.in/courses/106/101/106101061/
3.	https://www.coursera.org/learn/software-processes-and-agile-practices
4.	http://www.geeksforgeeks.org/software-engineering-gq/

PRAGATI ENGINEERING COLLEGE
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Computer Science and Engineering

Machine Learning

Course Category	Professional Core	**Course Code**	20AM6T02
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Probability and Statistics	**Internal Assessment** **Semester End** **Examination Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will:	
1	Identify problems that are amenable to solution by ANN methods, and which ML methodsmay be suited to solving a given problem.
2	Formalize a given problem in the language/framework of different ANN methods (e.g.,as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markovdecision process, etc).

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the fundamental usage of the concept Machine Learning system.	K2
CO2	Demonstrate on various regression Technique.	K2
CO3	Analyze the Ensemble Learning Methods.	K4
CO4	Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.	K4
CO5	Discuss the Neural Network Models and Fundamentals concepts of DeepLearning.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	--	--	--	--	--	--	--	--	2	2	2	1
CO2	3	2	1	--	--	--	--	--	--	--	--	1	1	1	1
CO3	3	2	1	--	--	--	--	--	--	--	--	--	1	1	1
CO4	3	2	1	--	--	--	--	--	--	--	--	--	1	1	1
CO5	3	2	1	--	--	--	--	--	--	--	--	--	1	1	1

COURSE CONTENT	
UNIT-I	Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning. Statistical Learning: Introduction, Supervised and Unsupervised Learning,Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.
UNIT-II	Supervised Learning: (Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes. Linear Models: Linear Regression, Logistic Regression, Generalized LinearModels, Support Vector Machines. Binary Classification: Multiclass/Structured outputs, MNIST, Ranking.
UNIT-III	**Ensemble Learning and Random Forests**: Introduction, Voting Classifiers,Bagging and Pasting, Random Forests, Boosting, Stacking. Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.
UNIT-IV	Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures. Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.
UNIT-V	Neural Networks: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

TEXT BOOKS	
1.	‖Machine Learning‖ , Tom M. Mitchell, Tata Mc – Graw Hill Publications, 2nd Edition, 2021
2.	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019.
REFERENCE BOOKS	
1.	Data Science and Machine Learning Mathematical and Statistical Methods,Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,25th November 2020.
2.	Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.
WEB RESOURCES:	
1	https:// https://onlinecourses.nptel.ac.in/noc21-cs24/preview

Compiler Design
CSE

Course Category	Professional Core	**Course Code**	20CS6T14
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Demonstrate phases in the design of compiler	K2
CO2	Organize Syntax Analysis, Top Down and LL(1) grammars	K3
CO3	Design Bottom Up Parsing and Construction of LR parsers	K4
CO4	Analyze synthesized, inherited attributes and syntax directed translation schemes	K4
CO5	Apply efficient algorithms to generate code for a target machine	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	2	1	2	-	-	-	-	-	-	-	1	1	1
CO2	2	2	2	2	3	-	-	-	-	-	-	-	1	1	1
CO3	2	2	2	2	2	-	-	-	-	-	-	-	1	1	1
CO4	2	2	3	2	2	-	-	-	-	-	-	-	1	1	1
CO5	2	1	1	1	2	-	-	-	-	-	-	-	1	1	1

COURSE CONTENT	
UNIT I	**Lexical Analysis:** Language Processors, Structure of a Compiler, Lexical Analysis, The Role of the Lexical Analyzer, Bootstrapping, Input Buffering, Specification of Tokens, Recognition of Tokens, Lexical Analyzer Generator-LEX, Finite Automata, Regular Expressions and Finite Automata, Design of a Lexical Analyzer Generator, Flex, Bison.
UNIT II	**Syntax Analysis:** The Role of the Parser, Context-Free Grammars, Derivations, Parse Trees, Ambiguity, Left Recursion, Left Factoring, **Top Down Parsing:** Pre Processing Steps of Top Down Parsing, Backtracking, Recursive Descent Parsing, LL (1) Grammars, Non-recursive Predictive Parsing, Error Recovery in Predictive Parsing.
UNIT III	**Bottom Up Parsing:** Introduction, Difference between LR and LL Parsers, Types of LR Parsers, Shift Reduce Parsing, SLR Parsers, Construction of SLR Parsing Tables, More Powerful LR Parses, Construction of CLR (1) and LALR Parsing Tables, Dangling Else Ambiguity, Error Recovery in LR Parsing, Handling Ambiguity Grammar with LR Parsers.
UNIT IV	**Syntax Directed Translation:** Syntax-Directed Definitions, Evaluation Orders for SDD‘s, Applications of Syntax Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD‘s. **Intermediate Code Generation:** Variants of Syntax Trees, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Backpatching, Intermediate Code for Procedures.
UNIT V	**Run Time Environments:** Storage Organization, Run Time Storage Allocation, Activation Records, Procedure Calls, Displays, **Code Optimization:** The Principle Sources of Optimization, Basic Blocks, Optimization of Basic Blocks, Structure Preserving Transformations, Flow Graphs, Loop Optimization, Data-Flow Analysis, Peephole Optimization **Code Generation:** Issues in the Design of a Code Generator, Object Code Forms, Code Generation Algorithm, Register Allocation and Assignment.

TEXT BOOKS	
1.	Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson Publishers, 2/e 2008.
2.	John Levine, –Flex and Bison,‖ O'Reilly Media, Inc., 2009.
REFERENCE BOOKS	
1.	Compiler Construction, Principles and Practice, Kenneth C Louden, Cengage Learning, 2008
2.	Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
3.	Optimizing Compilers for Modern Architectures, Randy Allen, Ken Kennedy, Morgan Kauffmann, 2001.
4.	Levine, J.R., T. Mason and D. Brown, Lex and Yacc, edition, O'Reilly & Associates, 2/e 1990
5.	Jean-Paul Tremblay, P. G. Sorenson, Sorenson Gaul G, –Theory and Practice of Compiler Writing,‖ McGraw-Hill, 2005.
6.	Cooper, Keith D.., Torczon, Linda., Cooper, Keith D.., Torczon, Linda, –Engineering a Compiler,‖ Netherlands: Elsevier Science, 2011.
WEB RESOURCES	
1.	http://nptel.ac.in.courses/106108052/1 (Prof. Y.N. Srikanth, IISc Bangalore)

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Cryptography and Network Security
CSE, IT

Course Category	Professional Core	**Course Code**	20IT6T10
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES The objective of the course is to	
1	The main objectives of this course are to explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and SSL/TLS.

COURSE OUTCOMES **Upon successful completion of the course, the student will be able to:**		**Cognitive level**
CO1	Explain different security threats and countermeasures and foundationcourse of cryptography mathematics.	K1
CO2	Classify the basic principles of symmetric key algorithms and operations ofsome symmetric key algorithms and asymmetric key cryptography	K2
CO3	Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC andsome more	K2
CO4	Design applications of hash algorithms, digital signatures and key management techniques	K3
CO5	Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL, TSL, andIPsec	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	2	-	-	-	-	-	-	-	-	2	2
CO2	3	2	3	1	2	-	-	-	-	-	-	-	2	2	2
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	2	2
CO4	3	2	3	3	3	-	-	-	-	-	-	-	1	1	2
CO5	3	2	3	3	3	-	-	-	-	-	-	-	1	1	2

COURSE CONTENT	
UNIT I	**Basic Principles:** Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.
UNIT II	**Symmetric Encryption:** Mathematics of Symmetric Key Cryptography, Introduction toModern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.
UNIT III	**Asymmetric Encryption:** Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography
UNIT IV	**Data Integrity, Digital Signature Schemes & Key Management:** Message Integrity andMessage Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.
UNIT V	**Network Security - I:** Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, **Network Security - II :** Security at the Network Layer: IPSec,System Security

TEXT BOOKS	
1.	Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay,McGraw Hill, 2015
2.	Cryptography and Network Security, 4th Edition, William Stallings, (6e) Pearson,2006
3.	Everyday Cryptography, 1st Edition, Keith M.Martin, Oxford,2016

REFERENCE BOOKS	
1.	Network Security andCryptography, 1st Edition, Bernard Meneges, Cengage Learning, 2018.

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Professional Elective-II
Mobile Computing
CSE, IT

Course Category	Professional Elective	**Course Code**	20CS6T15
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To understand the fundamentals of mobile communication
2	To understand the architecture of various Wireless Communication Networks
3	To understand the significance of different layers in mobile system Course Contents

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Develop a strong grounding in the fundamentals of mobile Networks	K3
CO2	Apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network	K3
CO3	Understand the IEEE 802.11WLAN Standards	K2
CO4	Analyze the Mobile Network Layer system working	K4
CO5	Understand the WAP Model	K2

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	2	1	-	-	-	-	-	-	-	-	1	1	-
CO2	2	2	1	1	-	-	-	-	-	-	-	-	1	1	-
CO3	2	2	1	2	-	-	-	-	-	-	-	-	1	1	-
CO4	1	2	2	2	-	-	-	-	-	-	-	-	1	1	-
CO5	2	2	1	2	-	-	-	-	-	-	-	-	1	1	-

COURSE CONTENT	
UNIT I	**Introduction to Wireless Networks:** Applications, History, Simplified Reference Model, Wireless transmission, Frequencies, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular Systems: Frequency Management and Channel Assignment, types of hand-off and their characteristics.
UNIT II	**MAC** – Motivation, SDMA, FDMA, TDMA, CDMA, Telecommunication Systems, GSM: Architecture Location tracking and call setup, Mobility management, Handover, Security, GSM, SMS, International roaming for GSM, call recording functions, subscriber and service data management, DECT, TETRA, UMTS, IMT-2000.
UNIT III	**Wireless LAN:** Infrared vs. Radio transmission, Infrastructure, Adhoc Network, IEEE 802.11WLAN Standards, Architecture, Services, HIPERLAN, Bluetooth Architecture & protocols.
UNIT IV	**Mobile Network Layer:** Mobile IP, Dynamic Host Configuration Protocol, Mobile Transport Layer, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/Fast recovery, Transmission/Time-out freezing, Selective retransmission, Transaction Oriented TCP.
UNIT V	**Support for Mobility:** Wireless Application Protocol: Architecture, Wireless Datagram Protocol, Wireless Transport Layer Security, Wireless Transaction Protocol, Wireless Session Protocol, Wireless Application Environment, Wireless Markup Language, WML Scripts, Wireless Telephone Application.

TEXT BOOKS	
1.	Jochen Schiller, –Mobile Communication‖, Second Edition, Pearson Education,2nd Edition, 2008.
2.	Raj Kamal, –Mobile Computing,‖ 3rd Edition, Oxford Universities Press,3rd Edition, 2018
REFERENCE BOOKS	
1.	William Stallings, –Wireless Communications and Networks‖, Second Edition, Pearson Education, 2004.
2.	C. Siva Ram Murthy, B. S. Manoj, –Adhoc Wireless Networks: Architectures and Protocols‖, Second Edition, Pearson Education, 2008.
WEB RESOURCES	
1.	https://onlinecourses.nptel.ac.in/noc16_cs13(Prof. Pushpendra Singh,IIIT-Delhi)

Big Data Analytics

CSE, IT, CSE(AI&ML), CSE(AI), CSE(DS)

Course Category	Professional Elective	Course Code	20DS6T02
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Data Mining	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSEOBJECTIVES	
1	To optimize business decisions and create competitive advantage with Big Data analytics
2	To learn to analyze the big data using intelligent techniques
3	To introduce programming tools PIG & HIVE in Hadoop echo system

COURSEOUTCOMES		**Cognitive level**
Upon successful completion of the course, the student will be able to:		
CO1	Illustrate big data challenges in different domains including social media, transportation, finance and medicine	K2
CO2	Enumerate and apply the features of Cassandra	K2
CO3	Design and develop Hadoop and Map Reduce programs	K3
CO4	Perform data analysis using Apache Spark	K2
CO5	Analyze the data analytics process with a case study	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	2	-	-	-	-	-	-	-	1	1	1
CO2	3	1	1	2	2	-	-	-	-	-	-	1	-	-	1
CO3	3	3	3	2	2	-	-	-	-	-	-	1	2	2	1
CO4	3	3	3	2	2	-	-	-	-	-	-	1	2	2	1
CO5	3	3	3	2	2	-	-	-	-	-	-	1	2	2	1

COURSECONTENT	
UNIT I	**Types of Digital Data:** Classification of Digital Data. Introduction to Big Data: Characteristic of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, What is Big Data? **Big Data Analytics:** Where do we Begin?, What is Big Data Analytics?, What Big Data Analytics isn't?, Classification of Analytics, Terminologies Used in Big Data Environments. The Big Data Technology Landscape: NoSQL. **(Text Book 1)**
UNIT II	**Introduction to Cassandra:** Apache Cassandra – An Introduction, Features of Cassandra, CQL Data Types, CQLSH, Keyspaces, CRUD, Collections, Using aCounter, Time to Live, Alter Commands, Import and Export. **(Text Book 1)**
UNIT III	**Hadoop** : Hadoop Overview, HDFS (Hadoop Distributed File System),Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator). **MAPREDUCE:** Introduction to MAPREDUCE Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression. **(Text Book 1)**
UNIT IV	**Introduction to Data Analysis with Spark**: What is Apache Spark, A unified Spark, Who uses Spark and for what?, A Brief History of Spark, Spark version and releases, Storage layers for Spark. **Programming with RDDs:** RDD Basics, Creating RDDs, RDD Operations, Passing functions to Spark, Common Transformations and Actions, Persistence. **(Text Book 2)**
UNIT V	**JasperReport using Jaspersoft:** Introduction to JasperReports, Connecting to MongoDB NoSQL Database, Connecting to Cassandra NoSQL Database. **Few Interesting Differences:** Difference between Data Warehouse and Data Lake, Difference between RDBMS and HDFS, Difference between HDFS and HBase, Difference between Hadoop MapReduce and Spark, Difference between Pig and Hive **(Text Book 1)**

TEXTBOOKS	
1.	Big Data and Analytics by Seema Acharya, Subhashini Chellappan, Second Edition, Wiley India Pvt. Ltd., 2019
2.	Learning Spark: Lightning-Fast Big Data Analysis by Andy Konwinski, Holden Karau, Matei Zaharia, Patrick Wendell, First Edition, O'Reilly, 2015
REFERENCEBOOKS	
1.	Big Data Analytics, by Radha Shankarmani, M Vijayalakshmi, Second Edition, Wiley India Pvt. Ltd., 2016
2.	Bill Franks, –Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics‖, John Wiley& sons, 2012.
3.	Hadoop: The Definitive Guide by Tom White, O'Reilly Media, Inc., 2009
4.	Bart Baesens, –Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)‖, John Wiley & Sons, 2014.
WEBRESOURCES	
1.	http://hadoop.apache.org/
2.	https://nptel.ac.in/courses/106104189/
3.	https://www.edx.org/course/big-data-fundamentals
4.	https://www.coursera.org/specializations/big-data
5.	https://www.wileyindia.com/big-data-and-analytics-2ed.html

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Object Oriented Analysis and Design
CSE, CSE(AI), CSE(AI&ML)

Course Category	Professional Elective	**Course Code**	20CS6T16
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Become familiar with all phases of OOAD
2	Master the main features of the UML.
3	Master the main concepts of Object Technologies and how to apply them at work and develop the ability to analyze and solve challenging problem in various domains
4	Learn the Object design Principles and understand how to apply them towards Implementation

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Analyze the nature of complex system and its solutions	K4
CO2	Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships	K2
CO3	Analyze &Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications	K4
CO4	Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams	K4
CO5	Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	2	-	-	-	-	-	-	-	3	3	3
CO2	3	3	2	2	2	-	-	-	-	-	-	-	3	3	3
CO3	3	3	2	2	2	-	-	-	-	-	-	-	3	3	3
CO4	3	3	2	2	2	-	-	-	-	-	-	-	3	3	3
CO5	3	3	2	2	2	-	-	-	-	-	-	-	3	3	3

COURSE CONTENT	
UNIT I	**Introduction:** The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems. **Case Study:** System Architecture: Satellite-Based Navigation
UNIT II	**Introduction to UML:** Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle. **Basic Structural Modeling:** Classes, Relationships, common Mechanisms, and diagrams. **Case Study:** Control System: Traffic Management.
UNIT III	**Class & Object Diagrams:** Terms, concepts, modeling techniques for Class & Object Diagrams. **Advanced Structural Modeling:** Advanced classes, advanced relationships,Interfaces, Types and Roles, Packages. **Case Study:** AI: Cryptanalysis.
UNIT IV	**Basic Behavioral Modeling-I:** Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams. **Case Study:** Web Application: Vacation Tracking System
UNIT V	**Advanced Behavioral Modeling:** Events and signals, state machines, processes and Threads,time and space, state chart diagrams. **Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams **Case Study:** Weather Forecasting

TEXT BOOKS	
1.	Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston , ‒Object- Oriented Analysis and Design with Applications‖, 3rd edition, 2022, PEARSON.
2.	Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.
REFERENCE BOOKS	
1.	Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2.	Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.
3.	Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4.	Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.
WEB RESOURCES	
1.	http://www.digimat.in/nptel/courses/video/106105153/L51.html

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Network Programming
CSE

Course Category	Professional Elective	**Course Code**	20CS6T17
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Demonstrate mastery of main protocols comprising the Internet.
2	Develop skills in network programming techniques.
3	Implement network services that communicate through the Internet
4	Apply the client-server model in networking applications.
5	Practice networking commands available through the operating system

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Compare and Contrast different models and sockets	K2
CO2	Demonstrate different TCP Echo server functions and I/O models	K2
CO3	Outline IPV4 and IPV6 Socket options	K2
CO4	Summarize daemon processing and Advanced input and output functions	K2
CO5	Analyze Broadcasting and multicasting	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	2	3	0	0	0	0	0	0	0	3	2	2
CO2	3	3	3	2	3	0	0	0	0	0	0	0	3	2	2
CO3	3	3	3	2	3	0	0	0	0	0	0	0	3	2	2
CO4	3	3	3	2	3	0	0	0	0	0	0	0	3	2	2
CO5	3	3	3	2	3	0	0	0	0	0	0	0	3	2	2

COURSE CONTENT	
UNIT I	**Introduction to Network Programming:** Introduction to Network Programming: OSI model, UNIX standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application Elementary Sockets: Sockets introduction, Elementary TCP sockets.
UNIT II	**TCP client server:** Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.I/O Multiplexing: I/O Models, the select and poll functions, Batch input and buffering, shutdown function.
UNIT III	**UDP and Socket options: Elementary UDP sockets:** Introduction UDP Echo server functions, lost datagram, summary of UDP example, Lack of flow control with UDP. **Socket options:** getsockopt and setsockopt functions. Socket states, Generic socket options IPV4 socket options, IPV6 socket options, ICMPV6 socket options and TCP socket options, SCTP socket options, fcntl function.
UNIT IV	**Advanced Sockets and Daemon Processes:** IPV4 and IPV6 interoperability, introduction, IPV4 client: IPV6 server, IPV6 client: IPV4 Server, IPV6 Address-testing macros. Daemon Processes and inetdSuperserver –Introduction, syslogd Daemon, syslog Function, daemon_init Function, inetd Daemon, daemon_inetd. Advanced I/O functions: Socket timeouts, recv and send functions, ready and writev functions, recvmsg and send msg functions, Ancillary data.
UNIT V	**Broadcasting and Multicasting:** Broadcasting introduction, broadcast addresses, unicast versus Broadcast, dg_cli function using broadcasting, race conditions, Multicasting addresses,multicasting versus broadcasting on a LAN, multicasting on a WAN, source-specific multicast, multcast socket options. **Raw Sockets**: Introduction, Raw Socket Creation, Raw Socket Output, Raw Socket Input, Ping Program, Traceroute Program

TEXT BOOKS	
1.	UNIX Network Programming, by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Pearson Education,Third Edition,2003
2.	UNIX Network Programming, 1st Edition, W. Richard Stevens. PHI.
REFERENCE BOOKS	
1.	UNIX Systems Programming using C++ T CHAN, PHI.
2.	UNIX for Programmers and Users, 3rd Edition Graham GLASS, King abls, Pearson Education
3.	Advanced UNIX Programming 2nd Edition M. J. ROCHKIND, Pearson Education
WEB RESOURCES	
1.	http://www.nitttrc.edu.in/nptel/courses/video/106105183/L24.html

Open Elective-II
Disaster Management

Course Category	Open Elective	**Course Code**	20CE6T40
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	----------	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To provide basic conceptual understanding of disasters.
2	To understand approaches of Disaster Management.
3	To build skills to respond to disaster.
4	To understand to reduce the intensity of future disasters.
5	To understand the Restoration of human life in the region.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		
CO1	Knowledge on characteristics of natural disasters	K2
CO2	Planning on approaches of Disaster Management	K2
CO3	Ability to plan and design the new skills in disaster response	K2
CO4	Role of remote sensing system in disaster area response	K2
CO5	Knowledge on the Restoration of human life in the region.	K2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	--	1	1	--	--	--	--	2	--	3	1	1
CO2	2	2	3	--	1	1	--	--	--	--	2	--	3	1	1
CO3	2	2	3	--	1	1	--	--	--	--	2	--	3	1	1
CO4	2	2	3	--	1	1	--	--	--	--	2	--	3	1	1
CO5	2	2	3	--	1	1	--	--	--	--	2	--	3	1	1

COURSE CONTENT	
UNIT I	**Natural Hazards and Disaster Management**: Introduction of DM – Inter disciplinary nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: Vegetal Cover floods, droughts – Earthquakes – landslides – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast.
UNIT II	**Man Made Disaster and Their Management Along With Case Study MethodsOf The Following:** Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrorism -threat in mega cities, rail and aircraft accidents, ground water, industries - Emerging infectious diseases and Aids and their management.
UNIT III	**Risk and Vulnerability:** Building codes and land use planning – Social Vulnerability – Environmental vulnerability – Macro-economic management and sustainable development, Climate change risk rendition – Financial management of disaster – related losses
UNIT IV	**Role of Technology in Disaster Managements:** Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities- electrical substations- roads and bridges mitigation programme for earth quakes – flowchart, geospatial information in agriculture drought assessment - Multimedia Technology in disaster risk management and training - Transformable Indigenous Knowledge in disaster reduction – Role of RS & GIS
UNIT V	**Multi-sectional Issues, Education and Community Preparedness:** Impact of disaster on poverty and deprivation - Climate change adaptation and human health - Exposure, health hazards and environmental risk-Forest management and disaster risk reduction -The Red cross and red crescent movement - Corporate sector and disaster risk reduction- Education in disaster risk reduction Essentials of school disaster education - Community capacity and disaster resilience-Community based disaster recovery - Community based disaster management and social capital-Designing resilience- building community capacity foraction

TEXT BOOKS	
1.	–Disaster Management guide lines‖, GOI-UND Disaster Risk program (2009-2012)
2.	Modh S. (2010) –Managing Natural Disasters‖, Mac Millan publishers India LTD.
REFERENCE BOOKS	
1.	Murty D.B.N. (2012) –Disaster Management‖, Deep and Deep Publication PVT.Ltd. New Delhi
WEB RESOURCES	
1	https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

Fundamentals of Electric Vehicles

Course Category	Open Elective	**Course Code**	20EE6T19
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To familiarize the students with the need and advantages of electric and hybrid electric vehicles.
2	To understand various power converters used in electric vehicles.
3	To know various architecture of hybrid electric vehicles.
4	To be familiar all the different types of motors suitable for electric vehicles.
5	To have knowledge on latest developments in strategies and other storage systems.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate different types of electric vehicles..	K3
CO2	Select suitable power converters for EV applications.	K2
CO3	Design HEV configuration for a specific application.	K4
CO4	Choose an effective method for EV and HEV applications.	K3
CO5	Analyze a battery management system for EV and HEV	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO1	1	-	-	-	-	2	2	-	-	-	-	2	1	1
CO2	2	3	-	-	-	1	1	-	-	-	-	-	2	2
CO3	-	3	-	-	-	1	-	-	-	-	2	2	1	2
CO4	3	2	-	-	-	2	1	-	-	-	2	-	1	2
CO5	2	-	-	-	-	2	-	-	-	-	-	2	2	2

COURSE CONTENT	
UNIT 1	**Introduction** Fundamentals of vehicles - Components of conventional vehicles - drawbacks of conventional vehicles – Need for electric vehicles - History of Electric Vehicles – Types of Electric Vehicles – Advantages and applications of Electric Vehicles.
UNIT 2	**Components of Electric Vehicles** Main components of Electric Vehicles – Power Converters - Controller and Electric Traction Motor – Rectifiers used in EVs – Bidirectional DC–DC Converters – Voltage Source Inverters – PWM inverters used in EVs.
UNIT 3	**Hybrid Electric Vehicles** Evolution of Hybrid Electric Vehicles – Advantages and Applications of Hybrid Electric Vehicles – Architecture of HEVs - Series and Parallel HEVs – ComplexHEVs – Range extended HEVs – Examples - Merits and Demerits.
UNIT 4	**Motors for Electric Vehicles** Characteristics of traction drive - requirements of electric machines for EVs – Different motors suitable for Electric and Hybrid Vehicles – Induction Motors – Synchronous Motors – Permanent Magnetic Synchronous Motors – Brushless DC Motors – Switched Reluctance Motors (Construction details and working only)
UNIT 5	**Energy Sources for Electric Vehicles** Batteries - Types of Batteries – Lithium-ion - Nickel-metal hydride - Lead-acid – Comparison of Batteries - Battery Management System – Ultra capacitors – Flywheels – Fuel Cell – it's working.

TEXT BOOKS	
1	Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2021.
2	Denton - Tom. Electric and hybrid vehicles. Rutledge - 2020.
REFERENCE BOOKS	
1	Kumar - L. Ashok - and S. Albert Alexander. Power Converters for Electric Vehicles. CRC Press - 2020.
2	Chau - Kwok Tong. Electric vehicle machines and drives: design - Analysis andApplication. John Wiley & Sons - 2015.
3	Berg - Helena. Batteries for electric vehicles: materials and electrochemistry. Cambridge university press - 2015
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108106170
2	https://inverted.in/blog/fundamentals-of-electric-vehicles

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Introduction to Automobile Engineering

Course Category	Open Elective	**Course Code**	20ME6T25
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn functions of different components in Automobiles
2	To impart knowledge on Transmission systems and Steering Systems.
3	To impart the knowledge on ignition system & suspension systems.
4	To impart the knowledge of Braking system and Engine specification.
5	To understand the concept of safety and Engine emission control systems

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the function of various components of automobile.	K2
CO2	Identify the merits and demerits of the various transmission and steering systems.	K2
CO3	Describe the concept of Ignition and Suspension systems.	K2
CO4	Explain the features of Braking system and Engine specification.	K3
CO5	Analyze the Engine emission control standards.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	2	2	-	-	-	-	-	2	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	2	-
CO3	2	2	1	-	-	-	-	-	-	-	-	-	2	-
CO4	3	2	1	1	-	2	2	-	-	-	-	-	2	1
CO5	2	2	1	-	-	-	2	-	-	-	-	1	3	-

COURSE CONTENT	
UNIT 1	INTRODUCTION: Components of four-wheeler automobile-chassis and body-power unit-types of automobile engines, engine construction, oil filters, oil pumps, air filters,Fuel pump, nozzle, Types of carburetors.
UNIT 2	TRANSMISSION SYSTEM: Clutches, principle, types, cone clutch, single plateclutch, multi plate clutch, magnetic and centrifugal clutches, Propeller shaft-Hotch- Kiss drive, Torque tube drive, universal joint, differential rear axles-types-wheels and tires. STEERING SYSTEM: Steering geometry-camber, castor, king pin rake, combined angle toe-in, center point steering. steering gears – types, steering linkages.
UNIT 3	IGNITION SYSTEM: Function of an ignition system, auto transformer, electronic ignition using contact triggers-spark advance and retard mechanism. SUSPENSION SYSTEM: Objects of suspension systems-rigid axle suspension system, torsion bar, shock absorber, independent suspension system.
UNIT 4	BRAKING SYSTEM: Mechanical brake system, hydraulic brake system, mastercylinder, pneumatic and vacuum brakes. ENGINE SPECIFICATION: Introduction-engine specifications with regard to power, speed, torque, no. of cylinders and arrangement.
UNIT 5	SAFETY SYSTEMS: Introduction, safety systems - seat belt, air bags, bumper, windshield, suspension sensors, traction control, mirrors. ENGINE EMISSION CONTROL: Introduction-types of pollutants, mechanism of formation, concentration measurement, methods of controlling-engine modification.

TEXT BOOKS	
1	Automotive Mechanics / Heitner.
2	Automobile Engineering / William Crouse, TMH Distributors
3	Automobile Engineering- P.S Gill, S.K. Kataria& Sons, New Delhi
REFERENCE BOOKS	
1	Automotive Engines Theory and Servicing, James D. Halderman and Chase D. Mitchell Jr., Pearson education inc.
2	Automotive Engineering / Newton Steeds & Garrett.
3	Automotive Mechanics – Vol. 1 & Vol. 2 / Kripal Singh, standard publishers.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/107/106/107106080/
2	http://gabook.cyou/file/nptel-automobile-engineering
3	https://nptel.ac.in/courses/107/106/107106088/

Sensors and Transducers

Course Category	Open Elective	**Course Code**	20EC6T26
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	25 75 100

COURSE OBJECTIVES: By studying this course the student will learn	
1	the principle of various Transducers and their construction
2	the transducer construction, classification, principle of operation and characteristics
3	about transducers for measurement of physical parameters
4	Temperature measurement using transducers
5	Applications and principles of operation, standards and units of measurements

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	discuss role of transducers and Sensor in instrumentation	K1
CO2	Descriptive view for the transducer construction, classification, principle of operation and characteristics.	K2
CO3	Gain knowledge about transducers for measurement of displacement,strain, velocity, analyze transducers for measurement of pressure , force and flow	K3
CO4	analyze transducers for measurement of Temperature	K4
CO5	Analyze sensors used in industrial applications	K4

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	-	1	-	-	-	-	-	-	-	-	-	-
CO2	1	2	2	-	1	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	2	-	-	-	-	-	-	-	-	-	-
CO4	2	3	2	-	2	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	-	2	-	-	-	-	-	-	-	-	-	-

COURSE CONTENT	
UNIT I	**Introduction:** Functional elements of an instrument, generalized performance characteristics of instruments – static characteristics, dynamic characteristics. Zero order, first order, second order instruments – step response, ramp response and impulse response. Response of general form of instruments to periodic input and to transient input
UNIT II	**Transducers for motion and dimensional measurements:** Relative displacement, translation and rotational resistive potentiometers, resistance strain gauges, LVDT, synchros, capacitance transducers, Piezo-electric transducers, electro-optical devices, nozzle – flapper transducers, digital displacement transducers, ultrasonic transducers, Gyroscopic sensors
UNIT III	**Transducers For Force Measurement**: Bonded strain gauge transducers, Photo-electric transducers, variable reluctance pickup, torque measurement dynamometers. **Transducers For Flow Measurement:** Hot wire and hot-film anemometers, Electro-magnetic flow meters, laser Doppler velocity meter **Transducers For Pressure Measurement:** Manometers, elastic transducers, liquid systems, gas systems, very high pressure transducers.
UNIT IV	**Transducers For Temperature Measurement:** Thermal expansion methods, Thermometers (liquid in glass), pressure thermometers, Thermocouples, Materials configuration and techniques. Resistance thermometers, Thermistors, junction semiconductors, Sensors, Radiation methods, Optical pyrometers, Dynamic response of temperature sensors heat flux Sensors, Transducers for liquid level measurement, humidity, silicon and quartz sensors, fiber optic sensors.
UNIT V	**Smart sensors:** Introduction – Primary Sensors – Excitation – Amplification – Filters – Converters – Compensation– Information Coding/Processing - Data Communication – Standards for Smart Sensor Interface – The Automation Sensors –Applications: Introduction – On-board Automobile Sensors (Automotive Sensors)– Home Appliance Sensors – Aerospace Sensors — Sensors for Manufacturing –Sensors for Environmental Monitoring

TEXT BOOKS	
1.	Sensors and Transducers, D. Paranaiba ,PHI Learning Private Limited.
2.	Mechatronics,W. Bolton ,Pearson Education Limited.
REFERENCE BOOKS	
1.	Transducers and Instrumentation, by D.V.S. Murthy (PHI)
2.	Instrumentation Measurement & Analysis, by B.C. Nakra, K.K. Choudry, (TMH)
WEB RESOURCES	
1.	https://youtu.be/hv-aBonZMRQ
2.	https://www.youtube.com/watch?v=qSa3GNjIyy0

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Machine Learning using Python Laboratory

Course Category	Professional Core	**Course Code**	20AM6L02
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Python Programming	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
The student will:	
1	This course will enable students to learn and understand different Data sets inimplementing the machine learning algorithms.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Design and Develop Python programs for various Learning algorithms	**K2**
CO2	Apply appropriate data sets to the Machine Learning algorithms	**K3**
CO3	Develop Machine Learning algorithms to solve real world problems	**K4**

K1: Remember, K2: Understand, K3: Apply, K4: Analyze

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	--	--	--	--	--	--	--	--	2	2	2	3
CO2	3	2	1	--	--	--	--	--	--	--	--	1	1	1	3
CO3	3	2	1	--	--	--	--	--	--	--	--	--	1	1	3

List of Experiments	
1	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on agiven set of training data samples. Read the training data from a .CSV file.
2	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 theset of all hypotheses consistent withthe training examples.
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use anappropriate data set for building the decision tree andapply this knowledge to classify a new sample.

4	Exercises to solve the real-world problems using the following machine learning methods: a) LinearRegression b) Logistic Regression c) Binary Classifier
5	Develop a program for Bias, Variance, Remove duplicates , Cross Validation
6	Write a program to implement Categorical Encoding, One-hot Encoding
7	Build an Artificial Neural Network by implementing the Back propagation algorithm and test thesame using appropriate data sets.
8	Write a program to implement k-Nearest Neighbor algorithm to classify theiris data set. Print bothcorrect and wrong predictions.
9	Implement the non-parametric Locally Weighted Regression algorithm in orderto fit data points. Select appropriate data set for your experiment and draw graphs.
10	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.
11	Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data setfor clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/PythonML library classes/API in the program.
12	Exploratory Data Analysis for Classification using Pandas or Matplotlib.
13	Write a Python program to construct a Bayesian network considering medicaldata. Use this model todemonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
14	Write a program to Implement Support Vector Machines and Principle Component Analysis.
15	Write a program to Implement Principle Component Analysis.

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Compiler Design using C Laboratory
CSE

Course Category	Professional Core	**Course Code**	20CS6L10
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To enlighten the student with knowledge base in compiler design and its applications

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Design simple lexical analyzers	K4
CO2	Apply Lex and Yacc tools	K3
CO3	Examine LR parser and generating SLR Parsing table	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	3	3	0	0	0	0	0	0	0	3	2	3
CO2	3	2	3	3	3	0	0	0	0	0	0	0	3	2	3
CO3	3	2	3	3	3	0	0	0	0	0	0	0	3	2	3

COURSE CONTENT	
List of Experiments	
1	Write a C program to identify different types of Tokens in a given Program.
2	Write a Lex Program to implement a Lexical Analyzer using Lex tool.
3	Write a C program to Simulate Lexical Analyzer to validating a given input String.
4	Write a C program to implement the Brute force technique of Top down Parsing.
5	Write a C program to implement a Recursive Descent Parser.
6	Write C program to compute the *First* and *Follow* Sets for the given Grammar.
7	Write a C program for eliminating the left recursion and left factoring of a given grammar
8	Write a C program to check the validity of input string using Predictive Parser.
9	Write a C program for implementation of LR parsing algorithm to accept a given input string.
10	Write a C program for implementation of a Shift Reduce Parser using Stack Data Structure to accept a given input string of a given grammar.
11	Simulate the calculator using LEX and YACC tool.
12	Generate YACC specification for a few syntactic categories.
13	Write a C program for generating the three address code of a given expression/statement.
14	Write a C program for implementation of a Code Generation Algorithm of a given expression/statement.

TEXT BOOKS	
1.	Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson Publishers, 2007.
2	John R Levine, Tony Mason, Doug Brown, "Lex and Yacc", Orielly, 2nd Edition, 2009.

PRAGATI ENGINEERING COLLEGE
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Computer Science and Engineering

Cryptography Network Security Laboratory
CSE, IT

Course Category	Professional Core	**Course Code**	20IT6L07
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	**15** **35** **50**

COURSE OBJECTIVES
The objectives of the course is to

1	To learn basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
2	To understand and implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher.

COURSE OUTCOMES **Upon successful completion of the course, the student will be able to:**		**Cognitive level**
CO1	Apply the knowledge of symmetric cryptography to implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher	K2
CO2	Demonstrate the different algorithms like DES, BlowFish, and Rijndael, encrypt the text ―Hello world‖ using Blowfish Algorithm.	K3
CO3	Analyze and implement public key algorithms like RSA, Diffie-HellmanKey Exchange mechanism, the message digest of a text using the SHA-1 algorithm	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	-	-	-	-	-	-	-	-	3	-	3
CO2	2	2	3	3	-	-	-	-	-	-	-	-	3	-	3
CO3	2	2	3	3	-	-	-	-	-	-	-	-	3	-	3

List of Experiments	
1.	Write a C program that contains a string (char pointer) with a value \Hello World‘. The program should XOR each character in this string with 0 and displays the result.
2.	Write a C program that contains a string (char pointer) with a value \Hello World‘. The programshould AND or and XOR each character in this string with 127 and display the result
3.	Write a Java program to perform encryption and decryption using the following algorithms: a) Ceaser Cipher b) Substitution Cipher c) Hill Cipher
4.	Write a Java program to implement the DES algorithm logic
5.	Write a C/JAVA program to implement the BlowFish algorithm logic
6.	Write a C/JAVA program to implement the Rijndael algorithm logic.
7.	Using Java Cryptography, encrypt the text ―Hello world‖ using BlowFish. Create your own keyusing Java key tool.
8.	Write a Java program to implement RSA Algorithm
9.	Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Considerthe end user as one of the parties (Alice) and the JavaScript application as other party (bob).
10.	Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

Skill Oriented Course - IV
Soft skills and inter personal communication

Course Category	Skill Oriented Course	**Course Code**	20HE6S01
Course Type	Laboratory	**L-T-P-C**	1 – 0 – 2 – 2
Prerequisites		**Total Marks**	50

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Understand the significance of soft skills and its importance towards his goal setting.
CO2	Develop interpersonal relations through effective communication and public speaking.
CO3	Build confidence exercising verbal and non-verbal techniques with analytical skills for his success.
CO4	Utilize various skills required to become a good leader and thorough professional.
CO5	Improve decision-making skills and problem-solving skills with emotional intelligence.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	-	1	-	-	-	-
CO5	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-

COURSE CONTENT	
UNIT - I	1. Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. 2. Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue. 3. Positivity and Motivation: Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels.
UNIT-II	1. Interpersonal Communication: Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills; corporate communication styles – assertion, persuasion, negotiation. 2. Public Speaking: Skills, Methods, Strategies and Essential tips for effective public speaking. 3. Non-Verbal Communication: Importance and Elements; Body Language.
UNIT-III	1. Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness. 2. Group Discussion: Importance, Planning, Elements, Skills assessed; effectively disagreeing, Initiating, Summarizing and Attaining the Objective. 3. Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success. 4. Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills
UNIT - IV	1. Etiquette and Manners – Social and Business. 2. Time Management – Concept, Essentials, Tips. 3. Personality Development – Meaning, Nature, Features, Stages,Models; Learning Skills; Adaptability Skills. 4. Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour; Assertiveness Skills.
UNIT- V	1. Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence

	2. Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods 3. Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills. 4. Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress.

Text books :	
1.	Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.
2.	English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010

WEB RESOURCES	
1.	https://nptel.ac.in/courses/109107121/
2.	https://www.goskills.com/Soft-Skills

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Computer Science and Engineering

Employability Skills-II

Course Category	Mandatory Course	**Course Code**	**20HE6T03**
Course Type	Theory	**L-T-P-C**	2 – 0 – 0 – 0
Prerequisites		**InternalAssessment** **Semester EndExamination** **Total Marks**	0 0 0

COURSE OBJECTIVE:	
1	To get employment in corporate world.

COURSE OUTCOMES		**LEVEL**
Upon successful completion of the course, the student will be able to:		
CO1	Endues an ability of an accurate usage of words in language.	K2
CO2	Develops logical inter-relation of words in usage.	K2
CO3	Helps to develop compendious usage in communication.	K2
CO4	Determines to concentrate on Non-Verbal interpretation.	K1
CO5	Enriches the ability in vocabulary usage.	K1

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	0	0	0	0	0	0	0	0	0	1	0	0
CO2	0	0	0	0	0	0	0	0	0	1	0	0
CO3	0	0	0	0	0	0	0	0	0	1	0	0
CO4	0	0	0	0	0	0	0	0	0	1	0	0
CO5	0	0	0	0	0	0	0	0	0	1	0	0

COURSE CONTENT	
UNIT I	**Words often confused.** Commonly Confused Words – Homonym – Homograph- Homophone.
UNIT II	**Analogies/Jumbled Sentences** Opposite Analogy - Cause and Effect Analogy - Problem and Solution Analogy - Effort and Result Analogy. Spotting the transition words or the linking words- Identify the Theme of the paragraph.
UNIT III	**One-word substitutions, sentence corrections** Subject-Verb Agreement - Verb form - Logical Predication and Modifiers – Comparisons.
UNIT IV	**Body Language** Facial expressions - Body movement and posture – Gestures - Eye contact – Space – Voice.
UNIT V	**Development of Verbal Ability.** Vocabulary- Word analogy – Antonyms and Synonyms - Verbal Coherence & Cohesion

TEXT BOOKS	
1.	Teaching Offender Education: Employability Activities: 14 Activities to Develop the Soft Skills for Working Life by Teresa Maria O'Hara, Nutcracker Press UK.
2.	BEST: Basic Employability Skills Training: Volume 1 by Sally J. Vonada
3.	Skills by Dr. Rabindranath Athri

WEB RESOURCES	
1.	https://www.collegiateparent.com/academics/build-employable-skill-sets-online/
2.	https://cte.ed.gov/initiatives/employability-skills-framework
3.	https://www.collegiateparent.com/academics/build-employable-skill-sets-online/
4.	https://www.skillsyouneed.com/general/employability-skills.html
5.	https://www.realityworks.com/product/online-employability-skills-programs/

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Natural Language Processing
Honors in CSE

Course Category	Honors in CSE	**Course Code**	20CS6H03
Course Type	Theory	**L-T-P-C**	4-0-0-4
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Understand the basic concepts of Natural Language Processing algorithms and Techniques for processing text

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Analyze the structure of words and ways to processing the diverse array of morphologies	K4
CO2	Analyze the document decomposition into manageable parts related by topic	K4
CO3	Analyze various methods of uncovering a sentence‘s internal structure	K4
CO4	Apply Semantic role labeling for verb argument classification	K3
CO5	Apply Language models to estimate score for tokens	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	2	3	3	2
CO3	3	2	3	3	2	-	-	-	-	-	-	2	3	2	3
CO4	3	3	2	3	3	-	-	-	-	-	-	3	3	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	2	3	3	3

COURSE CONTENT	
UNIT I	**Finding the Structure of Words:** Words and their Components- Tokens, Lexemes, Morphemes, Typology, Issues and Challenges- Irregularity, Ambiguity, Productivity, Morphological Models- Dictionary Lookup, Finite-State Morphology, Unification-Based Morphology, Functional Morphology, Morphology Induction
UNIT II	**Finding the Structure of Documents:** Sentence Boundary Detection, Topic Boundary Detection, Generative Sequence Classification Methods, Discriminative Local Classification Methods, Discriminative Sequence Classification Methods, Hybrid Approaches, Extensions for Global Modeling for Sentence Segmentation, Complexity of Approaches, Performance of Approaches
UNIT III	**Syntax Analysis:** Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure- Syntax Analysis using Dependency Graphs, Syntax Analysis using Phrase Structure Trees, Parsing Algorithms- Shift-Reduce Parsing, Hypergraphs and Chart Parsing, Minimum Spanning Trees and Dependency Parsing, Probabilistic Context-Free Grammars, Generative Models for Parsing, Discriminative Models for Parsing
UNIT IV	**Semantic Parsing:** Introduction, Structural Ambiguity, Word Sense, Entity and Event Resolution, Predicate- Argument Structure, Meaning Representation, System Paradigms, Word Sense- Resources, Systems, Software, Predicate-argument Structure- resources, Systems, Software, Meaning Representation- Resources, Systems, Software
UNIT V	**Language Modeling:** Introduction, n-gram Models, Language Model Evaluation, Parameter Estimation- Maximum-Likelihood Estimation and Smoothing, Bayesian Parameter Estimation, Large-Scale LanguageModels, Language Model Adaptation, Types of Language Models, Language Specific Modeling Problems, Multi lingual and Cross lingual Language Modeling

TEXT BOOKS	
1.	Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication
2.	Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary
REFERENCE BOOKS	
1.	Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106101007

Computer Networks$
Minors in CSE

Course Category	Minors in CSE	**Course Code**	20CS6M03
Course Type	Theory	**L-T-P-C**	3-0-2-4
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Understand the basic taxonomy, terminology and architectures of the computer networks
2	Analyze the services, protocols and features of the various layers of computer networks.
3	Understand the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Enumerate the basic concepts of Computer Networks	K1
CO2	Analyze protocols implemented in Data Link Layer for error and flow control.	K4
CO3	Design applications using internet protocols.	K3
CO4	Implement routing and congestion control algorithms.	K3
CO5	Develop application layer protocols and understand socket programming.	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	1	2	2	0	0	0	0	1	0	3	3	0
CO2	3	3	3	3	2	3	0	0	0	0	3	0	3	3	0
CO3	3	2	2	1	1	3	0	0	0	0	1	0	3	2	0

CO4	3	3	3	3	3	0	0	0	0	0	0	0	3	3	0
CO5	3	3	3	3	3	0	0	0	0	0	0	0	3	3	0

COURSE CONTENT	
UNIT I	**Introduction:** Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History. **Physical Layer** –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.
UNIT II	**Data link layer:** Design issues, **Framing**: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one‘s complement internet checksum, services provided to Network Layer, **Elementary Data Link Layer protocols**: simplex protocol, Simplex stop and wait, Simplex protocol for NoisyChannel. **Sliding window protocol:** One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.
UNIT III	**Media Access Control: Random Access**: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, **Controlled Access:**Reservation, Polling, Token Passing, **Channelization:** frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA). **Wired LANs:** Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.
UNIT IV	**The Network Layer Design Issues** – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing- Admission Control-Traffic Throttling-Load Shedding. Traffic Control Algorithm-Leaky bucket & Token bucket. **Internet Working:** How networks differ- How networks can be connected- Tunnelling, internetwork routing-, Fragmentation, network layer in the internet – IP protocols-IP Version 4 protocol-IPV4 Header Format, IP addresses, Class full Addressing, CIDR, NAT-, Subnets- IP Version 6-The main IPV6 header, Transition from IPV4 to IPV6, Comparision of IPV4 & IPV6- Internet control protocols- ICMP-ARP-DHCP
UNIT V	**The Transport Layer:** Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services- TCP features- Segment- A TCP connection- windows in TCP- flow control-Error control, Congestion control in TCP. **Application Layer** –- World Wide Web: HTTP, Electronic mail-Architecture- web based mail- email security- TELENET-local versus remote Logging-Domain Name System: Name Space, DNS in Internet ,- Resolution-Caching- Resource Records- DNS messages- Registrars-security of DNS Name Servers, SNMP.

LABORATORY COURSE CONTENT	
List of Experiments	
1	Study of Network devices in detail and connect the computers in Local Area Network.
2	Write a Program to implement the data link layer farming methods such as i) Character stuffing ii) bit stuffing.
3	Write a Program to implement data link layer farming method checksum.
4	Write a program for Hamming Code generation for error detection and correction.
5	Write a Program to implement on a data set of characters the three CRC polynomials – CRC12, CRC 16 and CRC CCIP.
6	Write a Program to implement Sliding window protocol for Goback N.
7	Write a Program to implement Sliding window protocol for Selective repeat.
8	Write a Program to implement Stop and Wait Protocol.
9	Write a program for congestion control using leaky bucket algorithm
10	Write a Program to implement Dijkstra_s algorithm to compute the Shortest path through agraph.

TEXT BOOKS	
1.	Computer Networks — Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2.	Data Communications and Networks – Behrouz A. Forouzan, Fifth Edition TMH.
REFERENCE BOOKS	
1.	Data Communications and Networks- Achut S Godbole, AtulKahate
2.	Computer Networks, Mayank Dave, CENGAGE
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106105081

2.	https://nptel.ac.in/courses/106105183

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Professional Elective-III
Cloud Computing
CSE, CSE(AI), CSE(AI&ML), CSE(DS), IT, EEE

Course Category	Professional Elective	**Course Code**	20CS7T12
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To explain the evolving computer model caned cloud computing
2	To introduce the various levels of services that can be achieved by cloud
3	To describe the security aspects in cloud

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Illustrate the key dimensions of the challenge of Cloud Computing	K2
CO2	Classify the Levels of Virtualization and mechanism of tools	K3
CO3	Analyze Cloud infrastructure including Google Cloud and Amazon Cloud	K4
CO4	Design Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud	K3
CO5	Analyze control storage systems and cloud security, the risks involved its impact and develop cloud application	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	2	1	3	1	3	-	-	-	-	-	-	-	3	3	3
CO2	2	1	3	1	3	-	-	-	-	-	-	-	3	3	3
CO3	2	1	3	1	3	-	-	-	-	-	-	-	3	3	3
CO4	2	3	3	3	3	-	-	-	-	-	-	-	3	3	3

CO5	2	1	3	3	3	-	-	-	-	-	-	-	3	3	3

COURSE CONTENT	
UNIT I	**Systems Modeling, Clustering and Virtualization:** Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, ,Performance, Security and Energy Efficiency
UNIT II	**Virtual Machines and Virtualization of Clusters and Data Centers:** ImplementationLevels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualizationfor Data-Center Automation.
UNIT III	**Cloud Platform Architecture:** Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure
UNIT IV	**Cloud Resource Management and Scheduling:** Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.
UNIT V	**Storage Systems:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

TEXT BOOKS	
1.	Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier,2014
REFERENCE BOOKS	
1.	Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier,First Edition,2013
2.	Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press,2014
3.	Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH,2009
4.	Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH
WEB RESOURCES	
1.	https://onlinecourses.nptel.ac.in/noc22_cs20/preview

Neural Networks and Soft Computing

CSE

Course Category	Professional Elective	**Course Code**	20CS7T13
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To introduce the foundations of Artificial Neural Networks.
2	To acquire the knowledge on Soft Computing Concepts
3	To learn various types of Genetic algorithms and its applications
4	To gain knowledge to apply optimization strategies

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the concepts of Artificial intelligence and soft compu techniques	K2
CO2	Analyze the concepts of Neural Networks and select the Learning Networks in modeling real world systems	K4
CO3	Make use of Fuzzy reasoning and Genetic algorithms for soft computing applications	K3
CO4	Classify Biologically inspired algorithm such as neural networks, genetic algorithms, ant colony optimization, and bee colony optimization	K4
CO5	Develop hybrid system incorporating neural network, genetic algorithms, fuzzy systems	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	0	0	0	0	0	0	0	0	2	1	0
CO2	3	2	1	1	0	0	0	0	0	0	0	0	2	1	0
CO3	3	2	1	1	0	0	0	0	0	0	0	0	2	1	0
CO4	3	2	1	1	0	0	0	0	0	0	0	0	2	1	0
CO5	3	2	1	1	0	0	0	0	0	0	0	0	2	1	0

COURSE CONTENT	
UNIT I	**Soft Computing and Artificial Intelligence:** Introduction of Soft Computing, SoftComputing vs. Hard Computing, Various Types of Soft Computing Techniques, Applications of Soft Computing, AI Search Algorithm, Predicate Calculus, Rules of Interference, Semantic Networks, Frames, Objects, Hybrid Models.
UNIT II	**Artificial Neural Networks and Paradigms:** Introduction to Neuron Model, Neural Network Architecture, Learning Rules, Perceptrons, Single Layer Perceptrons, Multilayer Perceptrons, Back propagation Networks, Kohnen's self organizing networks, Hopfield network, Applications of NN.
UNIT III	**Fuzzy Logic:** Introduction, Fuzzy sets and Fuzzy reasoning, Basic functions on fuzzy sets, relations, rule based models and linguistic variables, fuzzy controls, Fuzzy decision making, applications of fuzzy logic.
UNIT IV	**Genetic Algorithms and Swarm Optimizations:** Introduction, Genetic Algorithm, Fitness Computations, Cross Over, Mutation, Evolutionary Programming, Classifier Systems, Genetic Programming Parse Trees, Variants of GA, Applications, Ant Colony Optimization, Particle Swarm Optimization, Artificial Bee Colony Optimization.
UNIT V	**Hybrid Systems:** Neuro fuzzy hybrid systems, Adaptive neuro fuzzy inference systems, Fuzzy backpropagation network, Genetic neuro hybrid system, Genetic algorithm based backpropagation network, Genetic-fuzzy hybrid systems.

TEXT BOOKS	
1.	Simon S. Haykin, Neural Networks, Prentice Hall, 3rd edition,2009.
2.	S. Rajasekaran & G. A. Vijayalakshmi Pai –Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications‖, PHI,2013.
REFERENCE BOOKS	
1.	S. N. Sivanandam & S. N. Deepa ‖Principles of Soft Computing‖ Wiley – India, 2nd Edition, 2007.
2.	Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall, 1998.

3.	Jacek M. Zurada, Introduction to Artificial Neural Systems, Jaico Publishing House,1994
4.	Zimmermann, –Fuzzy Set Theory and its Application‖, 3rd Edition.
5.	D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.
6.	Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 3rd edition 2009.
WEB RESOURCES	
1.	http://nptel.ac.in/courses/117105084/

Ad-hoc and Sensor Networks

CSE

Course Category	Professional Elective	**Course Code**	20CS7T14
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Architect sensor networks for various application setups.
2	Devise appropriate data dissemination protocols and model links cost.
3	Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Analyze the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-basednetworks.	K4
CO2	Understand the principles and characteristics of wireless sensor networks.	K2
CO3	List the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks.	K4
CO4	Illustrate the various sensor network Platforms, tools and applications.	K2
CO5	List the issues and challenges in security provisioning and alsofamiliar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs.	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)															
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2	2	2	0	0	0	0	0	0	0	0	2	2	0
CO2	3	2	2	2	0	0	0	0	0	0	0	0	2	2	0
CO3	3	2	2	2	0	0	0	0	0	0	0	0	2	2	0
CO4	3	2	2	2	0	0	0	0	0	0	0	0	2	2	0
CO5	3	2	2	2	0	0	0	0	0	0	0	0	2	2	0

COURSE CONTENT	
UNIT I	**Introduction to Ad Hoc Wireless Networks-** Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.
UNIT II	**Routing Protocols for Ad Hoc Wireless Networks-** Introduction, Topology based versus Position based Approaches, Topology-based Routing Protocols- Proactive Routing Approach, Reactive Routing Approach, Hybrid Routing Approach, Position based Routing- Principles and Issues, Location Services, Forwarding Strategies
UNIT III	**Security protocols for Ad hoc Wireless Networks-** Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.
UNIT IV	**Basics of Wireless Sensors and Applications-** The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.
UNIT V	**Security in WSNs-** Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, **Dataflow Style Language-**TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

TEXT BOOKS	
1.	Ad Hoc and Sensor Networks – Theory and Applications, 2nd edition *Carlos Corderio Dharma P.Aggarwal*, World Scientific Publications / Cambridge University Press, March 2006
2.	Ad Hoc Wireless Networks – Architectures and Protocols, 1st edition, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004
REFERENCE BOOKS	

1.	Wireless Sensor Networks: An Information Processing Approach, 1st edition, *Feng Zhao, Leonidas Guibas*, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009
2.	Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, 1st edition, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008
3.	Ad hoc Networking, 1st edition,*Charles E.Perkins*, Pearson Education, 2001
4.	Wireless Ad hoc Networking, 1st edition, *Shih-Lin Wu, Yu-Chee Tseng*, Auerbach Publications, Taylor & Francis Group, 2007
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106105160

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Computer Forensics
CSE, IT, CE, ME, EEE, ECE

Course Category	Professional Elective	**Course Code**	20CS7T15
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Identify Security Risks And Take Preventive Steps
2	Understand the Forensics Fundamentals
3	Understand the Evidence Capturing Process

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the Cybercrime Fundamentals	K2
CO2	List the types of attacks on networks	K4
CO3	Analyze various tools available for Cybercrime Investigation	K4
CO4	Summarize the Computer Forensics and Investigation Fundamentals and tools	K2
CO5	Analyze the legal perspectives of Cybercrime	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2	2	1	0	2	0	0	0	0	2	2	2
CO2	3	2	2	2	2	1	0	2	0	0	0	0	2	2	2
CO3	3	2	2	2	2	1	0	2	0	0	0	0	2	2	2
CO4	3	2	2	2	2	1	0	2	0	0	0	0	2	2	2
CO5	3	2	2	2	2	1	0	2	0	0	0	0	2	2	2

COURSE CONTENT	
UNIT I	**Introduction to Cybercrime:** Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.
UNIT II	**Tools and Methods :** Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.
UNIT III	**Cyber Crime Investigation:** Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E- Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.
UNIT IV	**Computer Forensics and Investigations:** Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.
UNIT V	**Cyber Crime Legal Perspectives:** Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act-ITA2000, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime andPunishment, Cyberlaw, Technology and Students: Indian Scenario.

TEXT BOOKS	
1.	Sunit Belapure Nina Godbole –Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives‖, WILEY,First Edition 2011.
2.	Nelson Phillips and Enfinger Steuart, –Computer Forensics and Investigations‖, Cengage Learning, New Delhi, 2009.
REFERENCE BOOKS	
1.	Michael T. Simpson, Kent Backman and James E. Corley, –Hands on Ethical Hacking and Network Defence‖, Cengage, 2019.
2.	Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, NewDelhi,First Edition,2015
3.	Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar –Cyber Security and Cyber

	Laws‖ , Cengage,First Edition,2018.
WEB RESOURCES	
1.	CERT-In Guidelines- http://www.cert-in.org.in/
2.	https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [Online Course]
3.	https://computersecurity.stanford.edu/free-online-videos [Free Online Videos]
4.	Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu License: Creative Commons BY-NC-SA.

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Professional Elective-IV
Deep Learning

Course Category	Professional Core	**Course Code**	20AM7T04
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Machine Learning	**Internal Assessment** **Semester End Examination Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will:	
1	Learn deep learning methods for working with sequential data.
2	Learn deep recurrent and memory networks.
3	Learn deep Turing machines.
4	Apply such deep learning mechanisms to various learning problems.
5	Know the open issues in deep learning, and have a grasp of the current research directions.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Demonstrate the fundamental concepts learning techniques of ArtificialIntelligence, Machine Learning and Deep Learning.	K2
CO2	Discuss the Neural Network training, various random models**.**	K2
CO3	Explain the Techniques of Keras, TensorFlow, Theano and CNTK.	K3
CO4	Classify the Concepts of CNN and RNN.	K4
CO5	Implement Interactive Applications of Deep Learning.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	1	1	--	--	--	--	--	--	2	2	2	3
CO2	2	2	2	1	1	--	--	--	--	--	--	2	1	1	2
CO3	2	1	1	2	2	--	--	--	--	--	--	1	1	1	2
CO4	2	2	2	1	1	--	--	--	--	--	--	1	1	1	2
CO5	3	2	1	1	1	--	--	--	--	--	--	1	1	1	3

COURSE CONTENT	
UNIT-I	**Fundamentals of Deep Learning**: Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, **Fundamentals of Machine Learning**: Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting. [**Text Book 2**]
UNIT-II	**Introducing Deep Learning**: Biological and Machine Vision, Human andMachine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks. [**Ref Book 1**]
UNIT-III	**Neural Networks**: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews, Binary Classification, Classifying newswires, Multiclass Classification. [Text Book 2]
UNIT-IV	**Convolutional Neural Networks**: Nerual Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation. **Recurrent Neural Networks**: Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch. [**Ref Book 1**]
UNIT-V	**Interactive Applications of Deep Learning**: Machine Vision, Natural Language processing, Generative Adversial Networks, Deep Reinforcement Learning. [**Text Book 1**] **Deep Learning Research**: Autoencoders, Deep Generative Models: Boltzmann Machines Restricted Boltzmann Machines, Deep Belief Networks. [**Text Book 1**]

TEXT BOOKS	
1.	Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2.	Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433.
REFERENCE BOOKS	
1.	Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821
2.	Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412
3.	Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
4.	Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
5.	Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.
WEB RESOURCES:	
1	Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview

Social Networks & Semantic Web

CSE

Course Category	Professional Elective	**Course Code**	20CS7T16
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn Web Intelligence
2	To learn Knowledge Representation for the Semantic Web
3	To learn Ontology Engineering
4	To learn Semantic Web Applications, Services and Technology
5	To learn Social Network Analysis and semantic web

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Demonstrate social network analysis and measures	K2
CO2	Analyze random graph models and navigate social networks data	K4
CO3	Apply the network topology and Visualization tools	K3
CO4	Analyze the experiment with small world models and clustering models	K4
CO5	Compare the application driven virtual communities from social network Structure	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	0	0	0	0	0	0	0	1	2	1	1
CO2	3	3	1	2	0	0	0	0	0	0	0	1	2	1	1
CO3	3	2	2	2	0	0	0	0	0	0	0	1	2	1	1
CO4	3	2	1	2	0	0	0	0	0	0	0	1	2	1	1
CO5	3	2	0	1	0	0	0	0	0	0	0	1	2	1	1

COURSE CONTENT	
UNIT I	**Web Intelligence:** Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.
UNIT II	**Knowledge Representation for the Semantic Web:** Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web –Resource Description Framework(RDF) /RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.
UNIT III	**Ontology Engineering:** Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and OntologyMapping, Logic, Rule and Inference Engines.
UNIT IV	**Semantic Web Applications, Services and Technology:** Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, WebSearch Agents and Semantic Methods
UNIT V	**Social Network Analysis and semantic web:** What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks, Building Semantic Web Applications with social network features.

TEXT BOOKS	
1.	Thinking on the Web – Berners Lee, Godel and Turing, Wiley inter science, First Edition,2008.
2.	Social Networks and the Semantic Web, Peter Mika, Springer, 2007.
REFERENCE BOOKS	
1.	Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
2.	Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
3.	Information sharing on the semantic Web – Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
4.	Programming the Semantic Web, T. Segaran, C. Evans, J. Taylor, O'Reilly, SPD.
5.	Robert W. Sebesta, –Programming The World Wide Web,‖ Pearson, 2019
WEB RESOURCES	
1.	https://onlinecourses.nptel.ac.in/noc22_cs30/preview

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Computer Vision
CSE, CSE(AI), CSE(AI&ML)

Course Category	Professional Elective	**Course Code**	20AI7T02
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Transforms and Vector Calculus, Data Structures	**Internal Assessment** **Semester End Examination Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will:	
1	To introduce students the fundamentals of image formation
2	To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition;
3	To develop an appreciation for various issues in the design of computer vision and object recognition systems
4	To provide the student with programming experience from implementing computer vision and object recognition applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify basic concepts, terminology, theories, models and methods in the field of computer vision.	K1
CO2	Describe known principles of feature detection and matching	K2
CO3	Identify, formulate and solve problems in image processing and computer vision	K1
CO4	Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal.	K2
CO5	Suggest a design of a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	-	-	-	-	-	-	2	1	-
CO2	2	2	1	2	-	-	-	-	-	-	-	-	1	1	1

CO3	3	2	1	2	-	-	-	-	-	-	-	-	1	1	1
CO4	1	3	2	3	-	-	-	-	-	-	-	-	1	1	1
CO5	3	2	3	1	2	-	-	-	-	-	-	-	1	1	1

COURSE CONTENT	
UNIT-I	**Introduction:** Image Formation: Geometric Primitives and Transformation, Photometric Image Formation, Digital Camera, Image Processing: Point Operators, Linear Filtering, More Neighborhood Operators, Fourier Transforms, Pyramids and Wavelets, Geometric Transformations, Global Optimization.
UNIT-II	**Feature Detection and Matching:** Points and Patches, Edges, Lines, Segmentation: Active Contours, Split and Merge, Mean Shift and Mode Finding, Normalized Cuts, Feature-Based Alignment: 2D and 3D Feature-based Alignment, Pose Estimation,Geometric Intrinsic Calibration.
UNIT-III	**Structure and Motion:** Triangular, Two-frame Structure from Motion, Factorization, Bundle Adjustment, Constrained Structure and Motion, Dense Motion Estimation: Translation Alignment, Parametric Motion, Spline-based Motion, Optical Flow, Layered motion.
UNIT-IV	**Image Stitching:** Motion Models, Global Alignment, Composing, Computational Photography: Photometric Calibration, High Dynamic Range Imaging, Super-Resolutionand Blur Removal, image Matting and Compositing, Texture Analysis and Synthesis.
UNIT-V	**3D Reconstruction:** Shape From X, Active Range Finding, Surface Representation, Point-based Representation, Volumetric Representation, Model-based Reconstruction, Recovering Texture Maps and Albedos, Image- based Rendering: View Interpolation, Layered Depth Images, Light Fields and Lumigraphs, Environment Mattes, Video-based Rendering.

TEXT BOOKS	
1.	Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag LondonLimited, 2011.
2.	Simon J.D Prince, Computer Vision: Models, Learning and Inference, 1st Edition, 2012.
REFERENCE BOOKS	
1.	Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2.	Haralick& Shapiro, –Computer and Robot Vision‖, Vol II
3.	G_erardMedioni and Sing Bing Kang –Emerging topics in computer vision‖75
WEB RESOURCES:	
1	https://onlinecourses.nptel.ac.in/noc22_ee48/preview

PRAGATI ENGINEERING COLLEGE
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Computer Science and Engineering

Professional Elective-V
Blockchain Technologies

CSE, IT

Course Category	Professional Elective	**Course Code**	20IT7T16
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES
The objective of the course is to

1	To understand block chain technology and Crypto currency works

COURSE OUTCOMES		**Cognitive level**
Upon successful completion of the course, the student will be able to:		
CO1	Demonstrate the block chain basics, Crypto currency	K2
CO2	To compare and contrast the use of different private vs. public block chain and use cases	K2
CO3	Design an innovative Bit coin Block chain and scripts, Block chain Science onvaries coins	K3
CO4	Classify Permission Block chain and use cases – Hyper ledger, Corda	K2
CO5	Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and others	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	1	-	-	-	-	-	-	2	1	-
CO2	2	3	1	1	1	-	-	-	-	-	-	-	1	1	1
CO3	2	3	1	2	1	-	-	-	-	-	-	-	1	1	1
CO4	2	3	1	1	1	-	-	-	-	-	-	-	1	1	1
CO5	3	3	1	1	1	-	-	-	-	-	-	-	1	1	1

COURSE CONTENT	
UNIT I	**Introduction:** Introduction, basic ideas behind block chain, how it is changing the landscape of digitalization, introduction to cryptographic concepts required, Block chain or distributed trust, Currency, Cryptocurrency, How a Cryptocurrency works, Financial services, Bitcoin prediction markets.
UNIT II	Hashing, public key cryptosystems, private vs public block chain and use cases, Hash Puzzles, Extensibility of Block chain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Block chain Environment
UNIT III	**Introduction to Bitcoin:** Bitcoin Block chain and scripts, Use cases of Bitcoin Blockchain scripting language in micropayment, escrow etc. Downside of Bit coin mining, Block chain Science: Grid coin, Folding coin, Block chain Genomics.
UNIT IV	Ethereum, IOTA, The real need for mining, consensus, Byzantine Generals Problem, and Consensus as a distributed coordination problem, Coming to private or permissioned block chains, Introduction to Hyper ledger, Currency, Token, Campus coin, Coin drop as astrategy for Public adoption, Currency Multiplicity, Demurrage currency
UNIT V	Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations, Uses of Block chain in E-Governance, Land Registration, Medical Information Systems, Supply chain management.
TEXT BOOKS	
1.	Blockchain Blue print for Economy by Melanie Swan
REFERENCE BOOKS	
1.	Blockchain Basics: A Non-Technical Introduction in 25 Steps, 1st Edition, by Daniel Drescher
WEB RESOURCES	
1.	https://www.classcentral.com/course/edx-social-network-analysis-sna-9134
2.	https://www.coursera.org/learn/social-network-analysis

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Wireless Network Security
CSE

Course Category	Professional Elective	**Course Code**	20CS7T17
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To understand the importance of Wireless networks security and its application

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Identify the Threats in networks and provide Authentication to real time problems	K3
CO2	Identify and investigate in-depth both early and contemporary threats to wireless networks security	K3
CO3	Analyze and determine for any organization database security requirements and appropriate solutions	K4
CO4	Analyze IP Security Issues and solve real time problems	K4
CO5	Develop wireless Development Strategies in real time issues	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	1	2	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	1	2	-	-	-	-	-	-	-	3	3	3
CO3	3	2	3	1	2	-	-	-	-	-	-	-	3	3	3
CO4	3	2	3	3	3	-	-	-	-	-	-	-	3	3	3
CO5	3	2	3	3	3	-	-	-	-	-	-	-	3	3	3

COURSE CONTENT	
UNIT I	**Introduction to Wireless**: History of Wireless Technologies, History of Wireless Security,State of the Wireless Security Industry, 2001 **Wireless Threats:** Uncontrolled Terrain, Communications Jamming, DoS Jamming, Injections and Modifications of Data, Man-in-the-Middle (MITM) Attack, Rogue Client, Rogue Network Access Points, Attacker Equipment
UNIT II	**Introduction to Wireless Security Protocols and Cryptography:** Recovery the FUD, OSI Model, OSI Simplified, Internet Model, Wireless LAN Security Protocols, Cryptography, SSL/TLS, Secure Shell Protocols, Terminal Access and File Transfer, Port Forwarding a Word of Caution, Man-in-the-Middle of SSL/TLS and SSH, WTLS, WEP,802.1x, IP Security
UNIT III	**Security Considerations to Wireless Devices:** Wireless Device Security Issues, Physical Security, Information Leakage, Device Security Features, Application Security, Detailed Device Analysis, Laptops, Personal Digital Assistants (PDAS), Wireless Infrastructure **Wireless Technologies and Applications:** Introduction to Cellular Networks- FDMA, TDMA, CDMA, Spread Spectrum Primer, Analogy, TDMA Vs CDMA, PDC, Security Threats
UNIT IV	**Introduction to Wireless Data Networks:** Cellular Digital Packet Data (CDPD), CDPD Architecture, CDPD Security, Mobitex- Mobitex Architecture, Mobitex Security Architecture, Security Issues, Gateway, Security Model **Wireless Standards and Technologies:** Current and Future Technologies- Infrared, Radio, Spread Spectrum, OFDM, Current and Future Standards- IEEE 802 Standards, ETSI, Home RF, Ultra-wide band Radio (UWB)
UNIT V	**Wireless Deployment Strategies:** Implementing Wireless LAN‘s- Security Considerations Common Wireless Network Applications, Enterprise Campus Designs, Wireless IST Design, Retail and Manufacturing Design, Small Office/Home Office Design (SOHO), Zigbee Technology

TEXT BOOKS	
1.	Wireless Security, Merritt Maxim and David Pollino, Osborne/McGraw Hill, New Delhi, 2002
2.	Wireless Security Models: Threats and Solutions, Nichols and Lekka, Tata McGraw Hill, New Delhi 2001
REFERENCE BOOKS	
1.	Behrouz A.Forouzan, ―Cryptography & Network Security‖, Tata McGraw Hill, India, New Delhi,3rd Edition, 2015
2.	William Stallings, ―Cryptography and Network Security, Prentice Hall, New Delhi, 5th Edition,2011
3.	Bruce Schneier, –Applied Cryptography‖, John Wiley & Sons, New York, 2004
4.	Ata Elahi, Adam Gschwender, –ZigBee Wireless Sensor and Control Network,‖ Prentice Hall, 2010
WEB RESOURCES	
1.	https://www.coursera.org/lecture/computer-networking/wireless-security-3ZI1X

PRAGATI ENGINEERING COLLEGE
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Computer Science and Engineering

Ethical Hacking
CSE, IT

Course Category	Professional Elective	**Course Code**	20CS7T18
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
2	The course includes-Impacts of Hacking; Types of Hackers; Information Security Models, Information Security Program, Business Perspective, Planning a Controlled Attack
3	Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Explain the concepts related to hacking, ports and protocols, pen testing and virtualization	K2
CO2	Identify the applicable footprinting techniques and scanning methods	K3
CO3	Compare and Contrast Trojans, backdoors, worms and virus and it‘s countermeasures	K4
CO4	Analyze Sniffing and Social Engineering and it‘s attacks	K4
CO5	Make use of the applicable methods of cryptography, stegnography and Vulnerability Assessment	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	2	3	0	0	0	0	0	0	3	3	3	0
CO2	3	2	3	3	3	0	0	0	0	0	0	3	2	3	0
CO3	3	3	3	3	2	0	0	0	0	0	0	0	3	2	0
CO4	3	3	2	3	2	0	0	0	0	0	0	0	3	2	0
CO5	3	3	3	3	2	0	0	0	0	0	0	0	3	2	0

COURSE CONTENT	
UNIT I	**Introduction to Hacking:** Hacking, Types and phases of hacking, **Introduction to Ports & Protocols**: Ports, Protocols, Primary Network Types, **Virtualization & Introduction to Kali Linux:** Virtualization, Virtualization software, supported platforms, **Introduction to Penetration Testing:** Penetration test, Categories and Types of Penetration tests, Structure of Penetration Test Report.
UNIT II	**Footprinting:** Footprinting, Types, Using ping and ns Lookup commands in Windowscommand line, **Scanning:** Scanning, Basics of Scanning, Basic Techniques of Scanning, Enumerating DNS using dns enum, Performing flag scan using hping3.
UNIT III	**Hacking into System:** System Hacking, Password Cracking, Default password databases, Manual and Automated Password Cracking, Process of System Hacking, Using Keyloggers, **Trojans & Backdoors:** Trojans, Working of Trojan, Infection Techniques, Attack, Lifecycle and Classification of Virus, Worms, Virus Construction Kit.
UNIT IV	**Sniffing, Packet Analysis & Session Hijacking:** Sniffing, Packet Analysis, Types of Sniffing, Active and Passive Sniffing Techniques, Session Hijacking, **Social Engineering:** Social Engineering, Process, Identity Theft, Human and Computer Based Social Engineering Techniques, Phishing Process, Types of Phishing Attacks, Social Engineering Toolkit (SET)
UNIT V	**Steganography:** Steganography Process, watermarking, Steganography Methods andAttacks, Steganography tools, **Vulnerability Assessment:** Vulnerability, The Open Web Application Security Project (OWASP), Prevention, Damn Vulnerable Web Application(DVWA), installation and testing of DVWA

TEXT BOOKS	
1.	Hacking: Be a Hacker with Ethics, Harsh Bothra, Khanna Publications, First Edition,2017
2.	Ethical Hacking and Penetration Testing Guide, Rafay Baloch, 2014
REFERENCE BOOKS	
1.	Kali Linux Wireless Penetration Testing Beginner's Guide, Vivek Ramachandran, Cameron Buchanan, Packt Publishing, 2015
2.	SQL Injection Attacks and Defense, 2nd Edition,2012 Justin Clarke-Salt, Syngress Publication
3.	Mastering Modern Web Penetration Testing, Prakhar Prasad, Packt Publishing, October 2016
WEB RESOURCES	
1.	https://onlinecourses.nptel.ac.in/noc22_cs13/preview

Open Elective-III
Battery Management Systems and Charging Stations

Course Category	Open Elective	**Course Code**	20EE7T29
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To discuss about the different types of batteries.
2	To describe about the battery characteristic & parameters.
3	To apply the concepts of battery management system and design the battery pack.
4	To explain about the battery testing, disposal and recycling.
5	To describe different methods of EV charging

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Discuss about the different types of batteries.	K2
CO2	Describe about the battery characteristic & parameters.	K2
CO3	Apply the concepts of battery management system and design the battery pack.	K3
CO4	Explain about the battery testing, disposal and recycling.	K2
CO5	Describe different methods of EV charging	K2
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	-	-	-	-	-	-	-	-	-	-	1	1	1	-
CO2	2	-	-	-	-	-	-	-	-	-	-	1	1	1	-
CO3	2	1	1	-	1	1	1	-	-	-	-	1	1	1	-
CO4	2	-	-	-	1	1	1	-	-	-	-	1	1	1	-
CO5	2	-	-	-	-	-	-	-	-	-	-	1	1	1	-

COURSE CONTENT	
UNIT 1	**Batteries** Lead Acid Battery, Nickel based batteries, Sodium based batteries, Lithium based batteries – Li-ion & Li-poly, Metal Air Battery, Zinc Chloride battery; Ultra capacitors; Flywheel Energy Storage System; Hydraulic Energy Storage System;Comparison of different Energy Storage System Suggested reading: Study of different types of batteries
UNIT 2	**Battery Characteristics & Parameters** Cells and Batteries- conversion of chemical energy to electrical energy- Battery Specifications: Variables to characterize battery operating conditions and Specifications to characterize battery nominal and maximum characteristics; Efficiency of batteries; Electrical parameters Heat generation- Battery design Performance criteria for Electric vehicles batteries- Vehicle propulsion factors- Powerand energy requirements of batteries- Meeting battery performance criteria- setting new targets for battery performance.
UNIT 3	**Battery Pack and Battery Management System** Selection of battery for EVs & HEVs, Traction Battery Pack design, Requirement of Battery Monitoring, Battery State of Charge Estimation methods, Battery Cell equalization problem, thermal control, protection interface, SOC Estimation, Energy & Power estimation, Battery thermal management system, Battery Management System: Definition, Parts: Power Module, Battery, DC/DC Converter, load, communication channel, Battery Pack Safety, Battery Standards & Tests
UNIT 4	**Battery Testing, Disposal & Recycling** Chemical & structure material properties for cell safety and battery design, battery testing, limitations for transport and storage of cells and batteries, Recycling, disposaland second use of batteries. Battery Leakage: gas generation in batteries, leakage path, leakage rates. Ruptures: Mechanical stress and pressure tolerance of cells, safetyvents, Explosions: Causes of battery explosions, explosive process, Thermal Runway: High discharge rates, Short circuits, charging and discharging. Environment andHuman Health impact assessments of batteries, General recycling issues and drivers, methods of recycling of EV batteries.
UNIT 5	**Charging Stations** Electric Vehicle Technology and Charging Equipment‘s, Basic charging Block Diagram of Charger, Difference between Slow charger and fast charger, Slow chargerdesign rating, Fast charger design rating, AC charging and DC charging, Inboard and off board charger specification, Type of Mode of charger Mode -2, Mode-3 and Mode-4, EVSE associated charge times calculation.

TEXT BOOKS	
1	Guangjin Zhao, –Reuse and Recycling of Lithium-Ion Power Batteries‖, John Wiley & Sons. 2017. (ISBN: 978-1-1193-2185-9)
2	Arno Kwade, Jan Diekmann, ―Recycling of Lithium-Ion Batteries: The LithoRec Way‖, Springer, 2018. (ISBN: 978-3-319-70571-2)
REFERENCE BOOKS	
1	Ibrahim Dinçer, Halil S. Hamut and Nader Javani, –Thermal Management of Electric Vehicle Battery Systems‖, John Wiley& Sons Ltd., 2016.
2	Chris Mi, Abul Masrur & David Wenzhong Gao, –Hybrid electric Vehicle- Principles & Applications with Practical Properties‖, Wiley, 2011.
3	G. Pistoia, J.P. Wiaux, S.P. Wolsky, ―Used Battery Collection and Recycling‖, Elsevier, 2001. (ISBN: 0-444-50562-8)‖
4	T R Crompton, ―Battery Reference Book-3 rd Edition‖, Newnes- Reed Educational and Professional Publishing Ltd., 2000.
5	James Larminie, John Lowry, ―Electric Vehicle Technology Explained‖, John Wiley & Sons Ltd, 2003.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108106170
2	https://www.youtube.com/watch?v=omnQN5Z5vsA

Additive Manufacturing

Course Category	Open Elective	**Course Code**	20ME7T28
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
Students will learn	
1	Fundamentals of rapid prototyping and concepts of liquid-based rapid prototyping systems
2	Concepts of solid-based rapid prototyping systems
3	Concepts of powder-based rapid prototyping systems
4	Different rapid tooling processes
5	Rapid prototyping data formats and applications of additive manufacturing in various industries

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the rapid prototyping fundamentals & choose different liquid based rapid prototyping processes for manufacturing	K2
CO2	Choose different solid based rapid prototyping processes for manufacturing	K2
CO3	Choose different powder based rapid prototyping processes for manufacturing	K2
CO4	Choose different rapid tooling processes for prototyping manufacturing	K2
CO5	Elaborate the uses of additive manufacturing processes in various industries.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	1	-	-	-	-	-	-	-	1	2	-
CO2	1	2	2	1	-	-	-	-	-	-	-	1	2	-
CO3	1	2	2	1	-	-	-	-	-	-	-	1	2	-
CO4	1	2	2	1	-	-	-	-	-	-	-	-	1	-
CO5	1	-	-	-	1	-	-	-	-	-	-	-	1	-

COURSE CONTENT	
UNIT I	INTRODUCTION: Prototyping fundamentals, historical development, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, commonly used terms, classification of RP process. LIQUID-BASED RAPID PROTOTYPING SYSTEMS: Stereo lithography Apparatus (SLA): models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Photopolymers, photo polymerization, layering technology, laser and laser scanning. Solid Ground Curing (SGC): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.
UNIT II	SOLID-BASED RAPID PROTOTYPING SYSTEMS: Laminated object manufacturing (LOM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Fused deposition modelling (FDM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies.
UNIT III	POWDER BASED RAPID PROTOTYPING SYSTEMS: Selective laser sintering (SLS): models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Three-dimensional printing (3DP): models and specifications, process, working principle, applications, advantages and disadvantages, case studies
UNIT IV	RAPID TOOLING: Introduction to rapid tooling (RT), conventional tooling Vs RT, Need for RT. rapid tooling classification: indirect rapid tooling methods: spray metal deposition, RTV epoxy tools, Ceramic tools, investment casting, spin casting, die casting, sand casting, 3D Keltool process. Direct rapid tooling: direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.
UNIT V	ENHANCING ADDITIVE MANUFACTURING WITH REVERSE ENGINEERING: Reverse engineering, uses of reverse engineering, Steps for reverse engineering in additive manufacturing, 3D scanning techniques. RP APPLICATIONS: Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelry industry, coin industry, GIS application, arts and architecture. RP medical and bioengineering applications: planning and simulation of complex surgery, customized implants & prosthesis.

TEXT BOOKS	
1.	Chua C.K., Leong K.F., and Lim C.S., –Rapid prototyping: Principles and applications‖, Third Edition, World Scientific Publishers, 2010.
2.	Gebhardt A., –Rapid prototyping‖, Hanser Gardener Publications, 2003

REFERENCE BOOKS	
1.	Liou L.W. and Liou F.W., –Rapid Prototyping and Engineering applications: A tool box for prototype development‖, CRC Press, 2007.
2.	Kamrani A.K. and Nasr E.A., –Rapid Prototyping: Theory and practice‖, Springer, 2006.

3.	Hilton P.D. and Jacobs P.F., ‒Rapid Tooling: Technologies and Industrial Applications‖, CRC press, 2000.
WEB RESOURCES	
1.	nptel.ac.in/courses/112104204/47
2.	nptel.ac.in/courses/112107078/37
3.	https://www.youtube.com/watch?v=kNz- TM4zPkE&list=PLbTLRuAivTCR0YVCNxSTPI9lgccanmZLG
4.	https://lecturenotes.in/m/46059-note-of-additive-manufacturing-by-madhura-diwakar?reading=true
5.	https://www.slideshare.net/badebhau/additive-manufacturing-processes-pdf-by-badebhau4gmailcom

Industrial Electronics

Course Category	Open Elective	**Course Code**	20EC7T40
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	Basic Electrical and Electronics Engineering	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
Student will learn	
1	The building block for differential amplifier and operational amplifier using DC amplifiersand applications of OP-AMP.
2	a Voltage Regulator ,Types of Voltage Regulators and their working and use of a different voltage regulators for real time applications
3	The characteristics and operation of SCR and Thyristor and techniques to turn Off a Thyristor
4	The operation and applications of important switching devices such as DIAC and TRIAC much used in power electronics
5	The different electronic devices such as Electronic timers and Electronic DC Motor and Control, Electric Welding methods, high frequency heating ,ultrasonic generationrequired for industrial applications

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the concept of DC amplifiers.	K2
CO2	Analyze and design different voltage regulators for real time applications	K2
CO3	Describe the basis of SCR and Thyristor	K2
CO4	Determine the performance of DIAC and TRIAC	K2
CO5	Develop real time application using electronics	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	**1**	-	-	-	-	-	-	-	1	-	-	-	-
CO2	2	2	2	-	-	-	-	-	-	-	1	1	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	1	1	-	-	-
CO4	2	2	2	-	-	-	-	-	-	-	1	1	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	1	1	-	-	-

COURSE CONTENT	
UNIT I	DC Amplifiers: Need for DC amplifiers, DC amplifiers - Drift, Causes, Darlington Emitter Follower, Cascode amplifier, Stabilization, Differential amplifiers - Chopper stabilization, Operational Amplifiers, Ideal specifications of Operational Amplifiers, Instrumentation Amplifiers.
UNIT II	Regulated Power Supplies: Block diagram, Principle of voltage regulation, Series and Shunttype Linear Voltage Regulators, Protection Techniques - Short Circuit, Over voltage and Thermal Protection. Switched Mode & IC Regulators: Switched Mode voltage regulator, Comparison of Linear and Switched Mode Voltage Regulators,Servo Voltage Stabilizer, monolithic voltage regulators Fixed and Adjustable IC Voltage regulators, 3-terminal Voltage regulators - Current boosting
UNIT III	**SCR and Thyristor:** Principles of operation and characteristics of SCR, Triggering of Thyristors, Commutation Techniques of Thyristors - Classes A, B, C, D, E and F,Ratings of SCR.
UNIT IV	**Applications of SCR in Power Control:** Static circuit breaker, Protection of SCR, Inverters - Classification, Single Phase inverters, Converters –single phase Half waveand Full wave. DIAC, TRIAC and Thyristor Applications: Chopper circuits – Principle,methods and Configurations, DIAC AND TRIAC, TRIACS – Triggering modes, Firing Circuits, Commutation
UNIT V	**Industrial Applications -I:** Industrial timers -Classification, types, Electronic Timers – Classification, RC and Digital Timers, Time base Generators. Electric Welding Classification, types and methods of Resistance and ARC wielding, Electronic DC Motor Control. **Industrial Applications –II**: High Frequency heating – principle, merits, applications, High frequency Source for Induction heating. Dielectric Heating – principle, material properties, Electrodes and their Coupling to RF generator, Thermal losses and Applications. Ultrasonics – Generation and Applications

TEXT BOOKS	
1.	Industrial and Power Electronics – G. K. Mithal and Maneesha Gupta, Khanna Publishers, 19th Ed., 2003.
2.	Integrated Electronics – J. Millman and C.C Halkias, McGraw Hill, 1972
REFERENCE BOOKS	
1.	Electronic Devices and circuits – Theodore. H. Bogart, Pearson Education, 6th Edition, 2003
2.	Thyristors and applications – M. Rammurthy, East-West Press, 1977.
WEB RESOURCES	

1.	https://nptel.ac.in/courses/108102145

PRAGATI ENGINEERING COLLEGE
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Computer Science and Engineering

Organizational behavior

Course Category	Open Elective	**Course Code**	20HM7T09
Course Type	Theory	**Lecture-Tutorial-Practice**	3 -0 -0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
On successful completion of the course, the student will be able to		
CO 1	Understand the meaning and importance of Organizational Behavior to start and survive in corporate environment.	K2
CO 2	Demonstrate how the perception can integrate in human behaviour , attitudes and values.	K2
CO 3	Understand the importance of Groups and Teams in organizations for better Decision making.	K2
CO 4	Understand the need for change and its importance in organizations.	K2
CO 5	Understand the culture of organizations and to apply techniques in dealing with stress in organizations.	K4

Contribution of Course Outcomes towards achievement of Program

Outcomes: 1 – Low, 2 - Medium, 3 – High

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO1**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	-	1	-	2	2	2	-	2	-	-	-
CO2	-	-	-	-	-	1	-	3	2	3	-	2	-	-	-
CO3	-	-	-	-	-	1	-	2	3	3	-	2	-	-	-
CO4	-	-	-	-	-	1	-	3	3	2	-	2	-	-	-
CO5	-	-	-	-	-	3	-	1	2	2	-	2	-	-	-

COURSE CONTENT	
UNIT I	Introduction to Organizational Behaviour Concept-Nature and scope-Importance of Organizational Behaviour-Key elements of Organizational Behaviour-Role of managers in Organizational Behaviour-Approaches to Organizational Behaviour-Perspectives of Human Behaviour-Challenges and Opportunities for Organizational Behaviour.
UNIT II	Perceptual Management Nature-Process of Perception- Organization and Interpretation-Influencing factors- Importance of Perception in OB - Perceptual Errors- Attitudes and Values –Changes and Behaviour Modification Techniques-Impression Management
UNIT III	Introduction to Groups and Teams Meaning –Importance of Groups - Foundations of Group Behaviour –Reasons for Group formation-Group and Team-Types of Groups-Stages of Group development – Meaning and Importance of Teams- Factors affecting Group and Team performance- Types of teams-Creating an effective Team.
UNIT IV	Organization Change and Development Definition and Meaning - Need for change-Forces for changes in Organization-Types ofchange-Organizational Resistance-Strategies overcome Resistance-Process of change- Meaning and Definition of Organization Development-OD interventions.
UNIT V	Organizational Culture and Organizational Stress Organizational culture: Meaning and Nature of Organizational Culture-Functions- Types-Creating and maintain Organizational Culture-Managing Cultural Diversity. Organizational Stress: Definition and Meaning-Sources of stress-Impact of stress on organizations-Stress Management Techniques.

TEXT BOOKS	
1.	K.Aswathappa: ‒Organizational Behaviour-Text, Cases and Games‖, Himalaya Publishing House, New Delhi, 2017.
2.	Stephen P. Robbins, Timothy, A. Judge: ‒Essentials of Organizational Behaviour‖ Pearson,2017
3.	Pareek Udai, Sushma Khanna: ―Understanding Organizational Behaviour‖, Oxford University Press, New Delhi, 2016
REFERENCE BOOKS	
1.	Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2015
2.	Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: ‒Organizational Behavior‖, Tata McGraw Hill Education, New Delhi, 2017.
3.	Jerald Greenberg and Robert A Baron: ‒Behavior in Organizations‖, PHI Learning Private Limited, New Delhi, 2013.
4.	Jai B.P.Sinha: ‒Culture and Organizational Behavior‖, Sage Publication India Private Limited, New Delhi, 2009.
5.	New strom W. John& Davis Keith, Organisational Behaviour--Human Behaviour at Work, 12/e, TMH, New Delhi, 2009.

WEB RESOURCES	
1.	https://www.diversityresources.com/cultural-diversity-workplace/
2.	https://www.chanty.com/blog/problem-solving-techniques/
3.	https://www.simplypsychology.org/perspective.html#:~:text=The%20five%20major%20perspectives%20in,%2C%20behavioral%2C%20cognitive%20and%20humanistic
4.	https://theintactone.com/2019/06/18/mpob-u3-topic-6-perception-process-and-errors

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Computer Science and Engineering

Open Elective-IV Smart Grid Technologies

Course Category	Open Elective	Course Code	20EE7T30
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	NIL	Internal Assessment Semester End Examination Total Marks	30 70 100

COURSE OBJECTIVES	
1	To understand the basic concepts of smart grid.
2	To understand various smart grid technologies and its usage in smart applications.
3	To realize substation automation with intelligent sensors and have an idea on battery energy storage systems.
4	To have basic knowledge on micro grids and DG's.
5	To have an idea on communication technologies used in smart grid.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know the concepts of smart grids and analyze the smart grid policies and developments in smart grids.	K2
CO2	Analyze the concepts of smart grid technologies in hybrid electrical vehicles etc.	K4
CO3	Know the concepts of smart substations - feeder automation - Battery Energy storage systems etc.	K2
CO4	Analyze micro grids and distributed generation systems.	K4
CO5	Analyze the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	1	1	1	1	1	-	-	-	-	1	2	2	-
CO2	3	2	1	1	1	1	1	-	-	-	-	1	2	2	-
CO3	3	2	1	1	1	1	1	-	-	-	-	1	2	2	-
CO4	3	2	1	1	1	1	1	-	-	-	-	1	2	2	-
CO5	3	2	1	1	1	1	1	-	-	-	-	1	2	2	-

COURSE CONTENT	
UNIT 1	**Introduction to Smart Grid** Evolution of Electric Grid - Concept of Smart Grid - Definitions - Need of Smart

	Grid - Functions of Smart Grid - Opportunities & Barriers of Smart Grid - Difference between conventional & smart grid - Concept of Resilient & Self-Healing Grid - Present development & International policies on Smart Grid.
UNIT 2	**Smart Grid Technologies-1** Introduction to Smart Meters - Real Time Pricing - Smart Appliances - Automatic Meter Reading(AMR) - Outage Management System(OMS) - Plug in Hybrid Electric Vehicles(PHEV) - Vehicle to Grid - Smart Sensors - Home & Building Automation - Phase Shifting Transformers - Net Metering.
UNIT 3	**Smart Grid Technologies- 2** Smart Substations - Substation Automation - Feeder Automation. Geographic Information System(GIS) - Intelligent Electronic Devices (IED) & their application for monitoring & protection. Smart storage like Battery Energy Storage Systems (BESS) - Super Conducting Magnetic Energy Storage Systems (SMES) - Pumped Hydro - Compressed Air Energy Storage (CAES)
UNIT 4	**Micro grids and Distributed Energy Resources** Concept of micro grid - need & applications of microgrid - formation of microgrid - Issues of interconnection - protection & control of microgrid - Integration ofrenewable energy sources - Demand Response.
UNIT 5	**Information and Communication Technology for Smart Grid** Advanced Metering Infrastructure (AMI) - Home Area Network (HAN) - Neighborhood Area Network (NAN) - Wide Area Network (WAN).

TEXT BOOKS	
1	Integration of Green and Renewable Energy in Electric Power Systems - by Ali Keyhani - Mohammad N. Marwali - Min Dai Wiley - 2009.
2	The Smart Grid: Enabling Energy Efficiency and Demand Response - by Clark W.Gellings - Fairmont Press - 2009.
REFERENCE BOOKS	
1	The Advanced Smart Grid: Edge Power Driving Sustainability:1 by Andres Carvallo - John Cooper - Artech House Publishers July 2011
2	Control and Automation of Electric Power Distribution Systems (Power Engineering) by James Northcote - Green - Robert G. Wilson - CRC Press - 2017.
3	Substation Automation (Power Electronics and Power Systems) by MladenKezunovic - Mark G. Adamiak - Alexander P. Apostolov - Jeffrey George Gilbert - Springer - 2010.
4	Electrical Power System Quality by R. C. Dugan - Mark F. McGranghan - Surya Santoso -H. Wayne Beaty - McGraw Hill Publication - 2nd Edition.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108107113
2	https://electrical-engineering-portal.com/smart-grid-concept-and-characteristics

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Computer Science and Engineering

Sustainable Energy Technologies

Course Category	Open Elective	**Course Code**	20ME7T38
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To demonstrate the importance and solar radiation, solar energy collection and storage
2	To understand the energy sources and potential from wind energy, bio-mass, geothermal energy and ocean energy
3	To interpret energy efficient electrical and mechanical systems
4	To develop energy efficient processes
5	To understand features and benefits of green buildings

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate the importance and solar radiation, solar energy collection and storage.	K2
CO2	Understand the energy sources and potential from wind energy, bio-mass, geothermal energy and ocean energy.	K2
CO3	Analyze energy efficient electrical and mechanical systems.	K2
CO4	Understand features and benefits of green buildings.	K2
CO5	Understand the different types of unconventional machining methods and principles of finishing processes.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	-	3	-	-	-	3	-	3	-	-	2	-
CO2	3	2	2	-	3	-	-	-	3	-	3	-	-	2	-
CO3	3	2	2	-	3	-	-	-	3	-	3	-	-	2	-
CO4	3	2	3	-	3	-	-	-	3	-	3	-	-	2	-
CO5	3	2	3	-	3	-	-	-	3	-	3	-	-	2	-

COURSE CONTENT	
UNIT I	**SOLAR RADIATION**: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types ofPV cells. **SOLAR ENERGY COLLECTION**: Flat plate and concentrating collectors, classification of concentrating collectors, orientation. **SOLAR ENERGY STORAGE AND APPLICATIONS**: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.
UNIT II	**WIND ENERGY**: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement. **BIO-MASS**: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects. **GEOTHERMAL ENERGY**: Resources, types of wells, methods of harnessing the energy. **OCEAN ENERGY**: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques.
UNIT III	**ENERGY EFFICIENT SYSTEMS:** **ELECTRICAL SYSTEMS**: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management. **MECHANICAL SYSTEMS**: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, environmentally friendly and Energy efficient compressors and pumps**.**
UNIT IV	**ENERGY EFFICIENT PROCESSES:** Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmentally friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.
UNIT V	**GREEN BUILDINGS:** Definition, features and benefits. Sustainable site selection and planning of buildings for maximum comfort. Environmentally friendly building materials like bamboo, timber, rammed earth, hollow blocks, lime & lime pozzolana cement, agro materials and industrial waste, Ferro cement and Ferro-concrete, alternate roofing systems, paints to reduce heat gain of the buildings. Energy management.

TEXT BOOKS	
1.	Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH
2.	Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006
3.	Green Manufacturing Processes and Systems - J. Paulo Davim/Springer 2013
REFERENCE BOOKS	
1.	Alternative Building Materials and Technologies - K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New age international
2.	Principles of Solar Engineering - D.YogiGoswami, Frank Krieth & John F Kreider/Taylor & Francis
3.	Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd
4.	Renewable Energy Technologies -Ramesh & Kumar /Narosa
5.	Non conventional Energy Source- G.D Roy/Standard Publishers
6.	Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt. Ltd

Biomedical Instrumentation

Course Category	Open Elective	**Course Code**	20EC7T41
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Basics of Analog circuits	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: In this course the student will	
1	Study the physiological relation of human body – environment and Identify various errorsthat occur while measuring living system
2	Study various types of Electrodes and Transducers used in biomedical measurements
3	Learn Anatomy of Heart, Respiratory system and the measuring instruments.
4	Learn various fundamental blocks in patient care and monitoring
5	Study various diagnostic and therapeutic techniques

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Acquainted with the function of human body and measure active and resting potentials of cell bodies.	K2
CO2	Measure the Bioelectric potential using appropriate electrodes and Transducers.	K2
CO3	Know the mechanism and measurement of ECG for the Cardiac cycle and respiratory system	K2
CO4	Monitor the Patient care monitoring system and applications of therapeutic equipment	K2
CO5	Know the working principles of diagnostic equipment	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	-	-	-	-	-	-	-	-	-	1	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	1	-	-
CO3	1	1	2	-	-	-	-	-	-	-	-	-	-	1	-
CO4	-	1	2	2	-	-	-	-	-	-	-	-	-	1	-
CO5	-	1	1	1	2	-	-	-	-	-	-	-	1	-	-

COURSE CONTENT	
UNIT I	**INTRODUCTION TO BIOMEDICAL INSTRUMENTATION:** Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Problems Encountered in Measuring a Living System, Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Bio amplifiers
UNIT II	**ELECTRODES AND TRANSDUCERS:** Introduction to Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer principles, Biochemical Transducers, The Transducer and Transduction principles, Active Transducers, Passive Transducers.
UNIT III	**CARDIOVASCULAR SYSTEM AND MEASUREMENTS:** The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart sound,Plethysmography, Angiogram and Angioplasty **RESPIRATORY SYSTEM AND MEASUREMENTS:** The Physiology of the Respiratory System, Tests and Instrumentation for the Mechanics of Breathing, Respiratory Therapy Equipment.
UNIT IV	**PATIENT CARE AND MONITORING:** Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient- Monitoring equipmentOther Instrumentation for Monitoring Patients, Pacemakers, Defibrillators, Ventilators, Radio Frequency applications of Therapeutic use, ECG & EEG Recorders.
UNIT V	**DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY:** Principles of Ultrasonic Measurement, Ultrasonic imaging, Ultrasonic Applications of Therapeutic uses, Ultrasonic diagnosis, X-Ray and Radio-Isotope instrumentations, CAT Scan, Emission Computerized Tomography, MRI, and Telemedicine Technology.

TEXT BOOKS	
1.	Fundamentals of biomedical instrumentation –Dr.O.N.Pandey, S.K.Kataria & sons,4 th edition,2012
2.	Bio-Medical Instrumentation – Leslie Cromwell, Fred J.Weibell, Erich A. Pfeiffer, 2nd edition, PHI, 2011.
REFERENCE BOOKS	
1.	Hand Book of Bio-Medical Instrumentation – R.S.Khandapur, McGrawHill, 2nd edition,

	2003.
2.	Biomedical Instrumentation – Dr. M. Arumugam, Anuradha Publications, 2006
WEB RESOURCES	
1.	http://www.digimat.in/nptel/courses/video/108105101/L28.html

Marketing Management

Course Category	Open Elective	**Course Code**	20HM7T04
Course Type	Theory	**Lecture-Tutorial-Practice**	3 -0 -0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
On successful completion of the course, the student will be able to		
CO 1	Understand the concepts of Marketing and Marketing Environment.	K2
CO 2	Analyze the consumer behavior and market segmentation in order to maintain better consumer relations and product positioning respectively.	K4
CO 3	Make use of strategies and make decisions based on product life cycle and product mix concepts.	K3
CO 4	Understand the pricing effects and select a better distribution channel to reach the consumer.	K2
CO 5	Understand the promotional methods and importance.	K2

Contribution of Course Outcomes towards achievement of Program

Outcomes: 1 – Low, 2 - Medium, 3 – High

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	0	0	2	0	0	1	1	1	0	1	1	0	-	-	-
CO2	0	0	1	0	0	1	0	2	1	0	1	0	-	-	-
CO3	0	0	1	2	1	2	1	1	0	0	1	1	-	-	-
CO4	0	0	1	0	0	1	0	1	0	0	1	0	-	-	-
CO5	0	0	0	0	0	1	1	1	1	1	1	1	-	-	-

COURSE CONTENT	
UNIT I	**Introduction to Marketing**: Market and Marketing, Functions, importance and problems of marketing – Marketing Environment, Approaches to the study of marketing – Institutional Approach, Commodity approach, Management approach, systems approach to marketing.Marketing Mix(7 p's of Marketing.)
UNIT II	**Consumer Behavior and CRM** Meaning and features and Factors influencing Consumer Behavior – Theories of Buying Behavior (Economic theories – Marshallion model, psychological theories, psycho-analytic theories, socio-cultural theories) – buying decision process - Customer RelationshipManagement. **Market Segmentation** Market Segmentation – Bases of Segmenting Consumer Market and Industrial Market – Target Marketing – Product differentiation – Product Positioning.
UNIT III	**Product decision**: New product development – Product mix – management of product lifecycle – product strategies – product additions and deletions. Branding, packaging and labeling – product differentiation – planned obsolescence.
UNIT IV	**Pricing and Channels of distribution:** **Pricing:** Pricing objectives – Pricing methods – Pricing strategies. **Channels of Distribution:** Nature and types of marketing channels – wholesale distribution-retail distribution – direct marketing – selection of channels, Logistics, Third Party Service providers.
UNIT V	**Promotion :** Nature and Importance of promotion – promotional methods of personal selling : objectives and function, Advertising objectives – Message content – media selection – Advertising agency – Advertising Budgets – Measuring Advertising effectiveness; Sales promotion Techniques – Social Media Promotion

TEXT BOOKS	
1.	Phil T.Kotler – Marketing Management - Pearson Education limited – 2019
2.	S.A.Sherlekar – Marketing Management - Himalaya Publishing House - 2019
3.	Dr. K.Karunakaran – Marketing Management Himalaya Publishing House – 2010.

REFERENCE BOOKS	
1.	Priyanka Goel - Marketing Management – Atlantic publications - 2019.
2.	Philip Kotler and Lane Keller - Marketing Management – Pearson Educaion ltd – 2017
3.	L.Natarajan – Marketing Management – Margham Publications – 2012

WEB REFERENCES	
1.	https://www.tutorialspoint.com/marketing_management/marketing_management_functions
2.	https://keydifferences.com/difference-between-branding-and-packaging.html
3.	https://smallbusiness.chron.com/product-mix-639.html

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Computer Science and Engineering

Universal Human Values-II Understanding Harmony

Course Category	Humanities including Management	**Course Code**	20HM7T11
Course Type	Theory	**Lecture-Tutorial-Practice**	3 -0 -0
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
On successful completion of the course, the student will be able to		
CO 1	Understand the significance of value inputs in a classroom and start applying them in their life and profession	K2
CO 2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention andCompetence of an individual, etc.	K1
CO 3	Understand the role of a human being in ensuring harmony in society and nature.	K2
CO 4	Distinguish between ethical and unethical practices, and startworking out the strategy to actualize a harmonious environment wherever they work.	K1
CO 5	Understand the current scenario in Technology with respect to the Professional Ethics	K2

Contribution of Course Outcomes towards achievement of Program

Outcomes: 1 – Low, 2 - Medium, 3 – High

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	-	-	-	-	-	3	-	3	-	-	-	3	-	-	-
CO2	-	-	-	-	-	3	-	3	3	-	-	0	-	-	-
CO3	-	-	-	-	-	3	2	3	3	-	-	0	-	-	-
CO4	-	-	-	-	-	3	-	3	3	-	-	0	-	-	-
CO5	-	-	-	-	-	3	-	3	3	-	-	0	-	-	-

COURSE CONTENT	
UNIT I	**Introduction to Value Education:** Value Education, Definition, Concept and Need for Value Education, Content and Process of Value Education, Basic Guidelines for Value Education, Self exploration as a means of Value Education, Happiness and Prosperity as parts of Value Education.
UNIT II	**Harmony in the Human Being:** Human Being is more than just the Body, Harmony of the Self(_I') with the Body, Understanding Myself as Co-existence of the Self and the Body, Understanding Needs of the Self and the needs of the Body, Understanding the activities in the Self and the activities in the Body.
UNIT III	**Harmony in the Family and Society and Harmony in the Nature:** Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love. Comprehensive Human Goal: The Five Dimensions of Human Endeavour, Harmony in Nature: The Four Orders in Nature, The Holistic Perception of Harmony in Existence.
UNIT IV	**Social Ethics:** The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct,Holistic Alternative and Universal Order, Universal Human Order and Ethical Conduct, Human Rights violation and Social Disparities.
UNIT V	**Professional Ethics:** Value based Life and Profession, Professional Ethics and Right Understanding, Competence in Professional Ethics, Issues in Professional Ethics – The Current Scenario, Vision for Holistic Technologies, Production System and Management Models.

TEXT BOOKS	
1.	A.N Tripathy, New Age International Publishers, 2003.
2.	Bajpai. B. L , , New Royal Book Co, Lucknow, Reprinted, 2004
3.	Bertrand Russell Human Society in Ethics & Politics

REFERENCE BOOKS	
1.	Corliss Lamont, Philosophy of Humanism
2.	Gaur. R.R. , Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
3.	Gaur. R.R. , Sangal. R , Bagaria. G.P, Teachers Manual Excel Books, 2009.
4.	I.C. Sharma . Ethical Philosophy of India Nagin & co Julundhar
5.	Mortimer. J. Adler, – Whatman has made of man
6.	William Lilly Introduction to Ethic Allied Publisher

WEB REFERENCES	
1.	https://www.tandfonline.com/doi/abs/10.2753/RSP1061-1967330482?journalCode=mrsp20
2.	https://www.thefbcg.com/resource/building-family-harmony-starts-with-living-our-values/#:~:text=What%20does%20family%20harmony%20mean,family%20as%20a%20larger%20unit

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

Skill Oriented Course-V Deep Learning using PythonCSE, IT

Course Category	Skill Oriented	**Course Code**	20IT7S06
Course Type	Laboratory	**L-T-P-C**	0-0-4-2
Prerequisites		**Total Marks**	**50**

COURSE OBJECTIVES
The objective of the course is to

1	Understand the context of neural networks and deep learning

COURSE OUTCOMES		**Cognitive level**
Upon successful completion of the course, the student will be able to:		
CO1	Implement deep neural networks to solve real world problems	K3
CO2	Choose appropriate pre-trained model to solve real time problem	K3
CO3	Interpret the results of two different deep learning models	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	-	-	-	-	-	-	-	-	3	-	3
CO2	2	2	3	3	-	-	-	-	-	-	-	-	3	-	3
CO3	2	2	3	3	-	-	-	-	-	-	-	-	3	-	3

List of Experiments	
1	Implement multilayer perceptron algorithm for MNIST Hand written Digit Classification.
2	Design a neural network for classifying movie reviews (Binary Classification) using IMDBdataset.
3	Design a neural Network for classifying news wires (Multi class classification) using Reutersdataset.

4	Design a neural network for predicting house prices using Boston Housing Price dataset.
5	Build a Convolution Neural Network for MNIST Hand written Digit Classification.
6	Build a Convolution Neural Network for simple image (dogs and Cats) Classification
7	Use a pre-trained convolution neural network (VGG16) for image classification.
8	Implement one hot encoding of words or characters.
9	Implement word embeddings for IMDB dataset.
10	Implement a Recurrent Neural Network for IMDB movie review classification problem.
Software Packages required	
1.	Keras
2.	Tensorflow
3.	PyTorch
WEB RESOURCES	
1.	https://github.com/fchollet/deep-learning-with-python-notebooks

PRAGATI ENGINEERING COLLEGE
(Autonomous)
B.Tech **R-20**

Computer Science and Engineering

MEAN Stack Technologies- MongoDB, Express.js, Angular JSNode.js, and AJAX

CSE, CSE(AI), CSE(AI&ML), CSE(DS)

Course Category	Skill Oriented	**Course Code**	20CS7S07
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Total Marks**	50

COURSE OBJECTIVES	
1	To design dynamic web sites and web applications with Mean Stack Technologies

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Develop a basic web server using Node.js and also working with Node Package Manager (NPM).	K3
CO2	Apply Angular built-in or custom pipes to format the rendered data	K3
CO3	Make use of MongoDB queries to perform CRUD operations on document database	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	3	3	2	0	0	0	0	0	0	0	3	3	2
CO2	3	2	3	3	2	0	0	0	0	0	0	0	3	3	2
CO3	3	2	3	3	2	0	0	0	0	0	0	0	3	3	2

COURSE CONTENT

Software configuration and installation:

1. MongoDB

TOC - MongoDB Essentials - A Complete MongoDB Guide | Infosys Springboard

(onwingspan.com) 2. Angular Setup details: Angular Application Setup - Internal - Viewer Page | Infosys Springboard (onwingspan.com)	
List of Experiments	
1	a) Course Name: Node.js Module Name: How to use Node.js Verify how to execute different functions successfully in the Node.js platform. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19002830632103186000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course b) Course Name: Node.js Module Name: Create a web server in Node.js Write a program to show the workflow of JavaScript code executable by creating webserver in Node.js. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28177338996267815000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
2	a) Course Name: Node.js Module Name: Modular programming in Node.js Write a Node.js module to show the workflow of Modularization of Node application. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28865394191004004000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course b) Course Name: Node.js Module Name: Restarting Node Application Write a program to show the workflow of restarting a Node application. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9174073856000159000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course c) Course Name: Node.js Module Name: File Operations Create a text file src.txt and add the following data to it. Mongo, Express, Angular, Node. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33376440180246100000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
3	a) Course Name: Express.js

	Module Name: Defining a route, Handling Routes, Route Parameters, Query Parameters Implement routing for the AdventureTrails application by embedding the necessary codein the routes/route.js file. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_29394215542149950000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course b) Course Name: Express.js Module Name: How Middleware works, Chaining of Middlewares, Types of Middlewares In myNotes application: (i) we want to handle POST submissions. (ii) display customizederror messages. (iii) perform logging. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13930661312009580000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course c) Course Name: Express.js Module Name: Connecting to MongoDB with Mongoose, Validation Types and Defaults Write a Mongoose schema to connect with MongoDB. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303558875485440691_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course d) Course Name: Express.js Module Name: Models Write a program to wrap the Schema into a Model object. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303559389686988866 2_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
4	Course Name: Express.js Module Name: CRUD Operations Write a program to perform various CRUD (Create-Read-Update-Delete) operationsusing Mongoose library functions. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303568427012915269 6_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course Course Name: Express.js

	Module Name: API Development In the myNotes application, include APIs based on the requirements provided. (i) API should fetch the details of the notes based on a notesID which is provided in the URL. Test URL - http://localhost:3000/notes/7555 (ii) API should update the details bas https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303574525097574475 5_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course Course Name: Express.js Module Name: Why Session management, Cookies Write a program to explain session management using cookies. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24299316914857090000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course Course Name: Express.js Module Name: Sessions Write a program to explain session management using sessions. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_905413034723449100_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course Course Name: Express.js Module Name: Why and What Security, Helmet Middleware Implement security features in myNotes application https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_31677453061177940000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course
5	Course Name: Typescript Module Name: Basics of TypeScript On the page, display the price of the mobile-based in three different colors. Instead of using the number in our code, represent them by string values like GoldPlatinum, PinkGold, SilverTitanium.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2891035492950224500 0_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

Course Name: Typescript
Module Name: Function
Define an arrow function inside the event handler to filter the product array with the selected product object using the productId received by the function. Pass the selected product object to the next screen.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10783156469383723000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

Course Name: Typescript
Module Name: Parameter Types and Return Types
Consider that developer needs to declare a function - getMobileByVendor which accepts string as input parameter and returns the list of mobiles.
https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271291242705715290 1_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

Course Name: Typescript Module
Name: Arrow Function
Consider that developer needs to declare a manufacturer's array holding 4 objects with id and price as a parameter and needs to implement an arrow function - myfunction to populate the id parameter of manufacturers array whose price is greater than or equ

https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271291087550054490 4_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

Course Name: Typescript
Module Name: Optional and Default Parameters

	Declare a function - getMobileByManufacturer with two parameters namely manufacturer and id, where manufacturer value should passed as Samsung and id parameter should be optional while invoking the function, if id is passed as 101 then this function shoul https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271291494064128090 6_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
6	Course Name: Typescript Module Name: Rest Parameter Implement business logic for adding multiple Product values into a cart variable which istype of string array. https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271292186091520090 9_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course Course Name: Typescript Module Name: Creating an Interface Declare an interface named - Product with two properties like productId andproductName with a number and string datatype and need to implement logic to populate the Product details. https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271292524427673691 0_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course Course Name: Typescript Module Name: Duck Typing Declare an interface named - Product with two properties like productId andproductName with the number and string datatype and need to implement logic to populate the Product details. https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271292599545856091 2_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course Course Name: Typescript Module Name: Function Types Declare an interface with function type and access its value. https://infyspringboard.onwingspan.com/web/en/viewer/hands-

	on/lex_auth_01271294894534656091 8_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course
7	a) Course Name: MongoDB Essentials - A Complete MongoDB Guide Module Name: Installing MongoDB on the local computer, Create MongoDB AtlasCluster Install MongoDB and configure ATLAS https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821437313024030083_shared?collectionId=lex_auth_01317716929471283211 3_shared&collectionType=Course b) Course Name: MongoDB Essentials - A Complete MongoDB Guide Module Name: Introduction to the CRUD Operations Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove() https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821874166169630118_shared?collectionId=lex_auth_01317716929471283211 3_shared&collectionType=Course
8	a) Course Name: MongoDB Essentials - A Complete MongoDB Guide Module Name: Create and Delete Databases and Collections Write MongoDB queries to Create and drop databases and collections. https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821654119219230121_shared?collectionId=lex_auth_01317716929471283211 3_shared&collectionType=Course b) Course Name: MongoDB Essentials - A Complete MongoDB Guide Module Name: Introduction to MongoDB Queries Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate(). https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01328908162645196825 05_shared?collectionId=lex_auth_01317716929471283211 3_shared&collectionType=Course
9	a) Course Name: Angular JS Module Name: Angular Application Setup Observe the link http://localhost:4200/welcome on which the mCart application is running. Perform the below activities to understand the features of the application. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24049616594198490000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

	b) Course Name: Angular JS Module Name: Components and Modules Create a new component called hello and render Hello Angular on the page https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28217843279641040000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course c) Course Name: Angular JS Module Name: Elements of Template Add an event to the hello component template and when it is clicked, it should change the courseName. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19226434057992030000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course d) Course Name: Angular JS Module Name: Change Detection progressively building the PoolCarz application https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2560981637120771000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
10	a) Course Name: Angular JS Module Name: Structural Directives - ngIf Create a login form with username and password fields. If the user enters the correct credentials, it should render a "Welcome <<username>>" message otherwise it should render "Invalid Login!!! Please try again..." message https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01276374022604390425 95_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course b) Course Name: Angular JS Module Name: ngFor Create a courses array and rendering it in the template using ngFor directive in a listformat. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32795774277593590000_shared?collectionId=lex_20858515543254600000_

	shared&collectionType=Course c) Course Name: Angular JS Module Name: ngSwitch Display the correct option based on the value passed to ngSwitch directive. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_23388127475984175000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course d) Course Name: Angular JS Module Name: Custom Structural Directive Create a custom structural directive called 'repeat' which should repeat the element givena number of times. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24073319904331424000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

TEXT BOOKS	
1.	MongoDB – The Definitive Guide, 3rd Edition,2019, Kristina Chodorow, O'Reilly
2	Programming the World Wide Web, 8th Edition,2014 Robet W Sebesta, Pearson.
3	Pro Mean Stack Development, 1st Edition,2016 ELadElrom, Apress O'Reilly.
4	Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition,2014 SitePoint,SitePoint Pty. Ltd., O'Reilly Media.
WEB RESOURCES	
1	Node JS Download **Node.js** from the official site Setup details : How to use Node.js - Viewer Page | Infosys Springboard (onwingspan.com)
2	https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01317716929471283211 3_shared/overview (MongoDB)
3	https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)

Data Visualization
Honors in CSE

Course Category	Honors in CSE	**Course Code**	20CS7H05
Course Type	Theory	**L-T-P-C**	4-0-0-4
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Analyze patterns, trends and outliers in large data sets

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understand visual perception and representation of data	K2
CO2	Design visualization applications with various projections of different views of objects	K3
CO3	Apply various Interaction and visualization techniques	K3
CO4	Analyze various groups for visualization	K4
CO5	Evaluate visualizations of volumetric data with maps and GIS systems	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3	3	2	3	-	-	-	-	-	-	3	3	3	3
CO2	2	3	3	2	3	-	-	-	-	-	-	3	3	3	3
CO3	2	3	3	2	3	-	-	-	-	-	-	3	3	3	3

CO4	2	3	2	3	3	-	-	-	-	-	-	3	3	3	3
CO5	2	3	2	3	3	-	-	-	-	-	-	3	3	3	3

COURSE CONTENT	
UNIT I	**INTRODUCTION TO DATA VISUALIZATIONS AND PERCEPTION:** Introduction of visual perception, visual representation of data, Gestalt principles, Information overload.
UNIT II	**VISUAL REPRESENTATIONS:** Creating visual representations, visualization referencemodel, visual mapping, visual analytics, Design of visualization applications.
UNIT III	**CLASSIFICATION OF VISUALIZATION SYSTEMS:** Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.
UNIT IV	**VISUALIZATION OF GROUPS:** Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization. Various visualization techniques, data structures used in data visualization.
UNIT V	**VISUALIZATION OF VOLUMETRIC DATA AND EVALUATION OF VISUALIZATIONS:** Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations

TEXT BOOKS	
1.	Ward, Grinstein, Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick, 2nd edition,A K Peters, Ltd 2015.
REFERENCE BOOKS	
1.	Tamara Munzner,Visualization Analysis & Design ,1st edition,AK Peters Visualization Series2014
2.	Scott Murray,Interactive Data Visualization for the Web ,2nd Edition, 2017
WEB RESOURCES	
1.	https://freevideolectures.com/course/4041/nptel-introduction-to-learning-analytics/11
2.	https://www.coursera.org/learn/datavisualization

PRAGATI ENGINEERING COLLEGE
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B.Tech **R-20**

Computer Science and Engineering

Database Management Systems$
Minors in CSE

Course Category	Minors in CSE	**Course Code**	20CS7M05
Course Type	Theory	**L-T-P-C**	3-0-2-4
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To introduce about database management systems and To give a good formal foundation on the relational model of data and usage of RelationalAlgebra
2	To introduce the concepts of basic SQL as a universal Database language
3	To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Describe a relational database and object-oriented database	K2
CO2	Create, maintain, and manipulate a relational database using SQL	K3
CO3	Describe ER model for database design	K1
CO4	Design a database with understanding on Normalization	K2
CO5	Understand the storage, recovery and accessing mechanisms	K2

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	3	-	-	-	-	-	-	-	-	-	1	3	-
CO2	3	3	3	-	-	-	-	-	-	-	-	1	1	1	2
CO3	3	3	3	2	-	-	-	-	-	-	-	1	1	1	1
CO4	3	3	3	-	-	-	-	-	-	-	-	1	1	1	2
CO5	3	2	1	-	-	-	-	-	-	-	-	1	1	1	2

COURSE CONTENT	
UNIT I	Introduction: Database system, Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment. Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.
UNIT II	Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).
UNIT III	SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations. Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing: Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning
UNIT IV	Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NFand 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF)
UNIT V	Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testingfor Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm

LABORATORY COURSE CONTENT	
List of Experiments Note: For performing the experiments consider any case study (ATM/ Banking/ Library/Hospitalmanagement systems)	
1	Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2	Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student whosecured fourth rank in the class.
3	Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.

4	Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5	i. Create a simple PL/SQL program which includes declaration section, executable section, and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raisedif no records were found) ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6	Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7	Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR
8	Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9	Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10	Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.

TEXT BOOKS	
1.	Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2.	Database System Concepts,5/e, Silberschatz, Korth, TMH
REFERENCE BOOKS	
1.	Introduction to Database Systems, 8/e C J Date, PEA.
2.	Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3.	Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/105/106105175/
2.	https://www.geeksforgeeks.org/introduction-to-nosql/