R20 COURSE STRUCTURE AND SYLLABUS

For

B. Tech.

CSE – Data Structures

(Applicable for batches admitted from 2020-21)



PRAGATI ENGINEERING COLLEGE

(AUTONOMOUS)

Permanently Affiliated to JNTUK, Kakinada, Accredited by NAAC with "A" Grade Recognized by UGC 2(f) and 12(b) under UGC act, 1956

1-378, ADB Road, Surampalem – 533 437 Near Peddapuram, E.G.Dist, Andhra Pradesh



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

COURSE STRUCTURE

Semester- 0	
3 Weeks Induction Program to be conducted at the beginning of First year	

Zero Semester

Induction program	3 weeks duration				
(mandatory)					
	Physical activity				
	• Creative Arts				
Induction program for students	Universal Human Values				
to be offered right at the start of	• Literary				
the first year	Proficiency Modules				
the first year.	• Lectures by Eminent People				
	• Visits to local Areas				
	• Familiarization to Dept./Branch and Innovations				

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days. We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.2 The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

	I-I									
S.No	Category	Course	Course Title	Hours	Hours per week					
		Code		L	Т	P	С			
1	HS		Professional Communicative English	3	0	0	3			
2	BS		Differential Equations and Numerical Methods	3	0	0	3			
3	BS		Applied Chemistry	3	0	0	3			
4	ES		Programming for Problem Solving using C	3	0	0	3			
5	ES		Computer Engineering Workshop	1	0	4	3			
6	HS		Professional Communicative English Lab	0	0	3	1.5			
7	BS		Applied Chemistry Lab	0	0	3	1.5			
8	ES		Programming for Problem Solving using C Lab	0	0	3	1.5			
9	MC		Environmental Science	2	0	0	0			
	15	0	13	19.5						



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

Department of Basic Sciences & Humanities

R20 syllabus.

<Professional Communicative English >

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

DETAILED TEXTBOOK:

• **PROFESSIONAL COMMUNICATIVE ENGLISH** *Published by Maruthi Publishers.*

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.

UNIT 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 and profit.

Outcome: Acquisition of LSRW skills



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

UNIT 2:

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 and profit.

Outcome: Acquisition of LSRW skills

UNIT 3:

- '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 to globalization.
- 2. 'The Scarecrow' from Panorama: A Course on Reading

Objective: To develop extensive reading skill and comprehension for pleasure and profit. Outcome: Acquisition of LSRW skills

UNIT 4:



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

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 and profit.

Outcome: Acquisition of LSRW skills

UNIT 5:

1. 'The Chief Software Architect' from Professional Communicative English.

Objective: Supports the developments of technology for the betterment of human life.

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 and profit.

S.NO		COURSE OUTCOME	Cognitive Level
1	C01	Emphasizes that the ultimate aim of Education is to enhance wisdom and inspires the readers to serve their nation with their self-enrichment.	К2

Outcome: Acquisition of LSRW skills



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

2	CO2	Enables the learners to promote peaceful co-existence and universal harmony in society and empowers them to initiate innovation.	К2
3	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.	КЗ
4	CO4	Arouses the thought of life to lead in the right path by recognizing the importance of work besides enhancing their LSRW skills.	К2
5	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

R20- B.Tech – CSE (DATA SCIENCE)

K1- Remembering, K2- Understanding, K3-Applying, K-4 Analyzing, K5- Evaluating, K6- Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
со	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO1 2	PSO1	PSO2
C01	-	-	-	-	-	2	-	-	-	2	-	-		
CO2	-	-	-	-	-	-	-	2	-	3	-	-		
CO3	-	-	-	-	-	2	-	-	-	2	-	-		
CO4	-	-	-	-	-	-	-	-	-	2	-	2		
CO5	-	-	-	-	-	-	-	-	-	2	-	2		



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

Differential Equations and Numerical Methods (Common to CE, EEE, ME, ECE, CSE,CSE-DS, CSE-AI&ML& IT)

I B. Tech I Semester

Course Category	Basic Sciences	Course Code	
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites		InternalAssessment	30
	Differentiation, Integration	Semester EndExamination	70
		Total Marks	100

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

COURSE OUTCOMES

Upon s	uccessful completion of the course, the student will be able to:	Cognitive Level
CO1	solve first order differential equations and its applications	К3
CO2	solve the linear differential equations with constant coefficients by appropriate method	К3
CO3	apply Newton, Gauss and Lagrange interpolation formulae to find interpolating polynomials for the given data.	К3
CO4	find the approximate roots of transcendental equations by using different numerical methods	K2
CO5	solve initial value problems by using different numerical schemes	К3



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

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	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-

COURSE (CONTENT
UNITI	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.
UNITII	Linear differential equations of higher order Non-homogeneous equations of higher order with constant coefficients with non- homogeneous form e^{ax} , sin ax, cos ax polynomials in x^n , $e^{ax}V(x)$, $x^mV(x)$ - Method of Variation of parameters.
UNITIII	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.
UNITIV	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).



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

TE	XT BOOKS
1.	B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India
RE	FERENCE 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.
WI	EB RESOURCES
	UNIT I: Differential equations of first order and first degree
1	https://en.wikipedia.org/wiki/Differential_equation
1.	http://um.mendelu.cz/maw-html/index.php?lang=en&form=ode
	https://www.khanacademy.org/math/differential-equations/first-order-differential-equations
	UNIT II: Linear differential equations of higher order
	https://en.wikipedia.org/wiki/Differential_equation
2.	http://um.mendelu.cz/maw-html/index.php?lang=en&form=ode
	https://nptel.ac.in/courses/122107037/20
	UNIT III: Interpolation
3.	https://en.wikibooks.org/wiki/Introduction_to_Numerical_Methods/Interpolation
	UNIT IV: Solution of Algebraic and Transcendental Equations
4.	https://en.wikibooks.org/wiki/Numerical_Methods/Equation_Solving
	https://www.slideshare.net/100005232690054/algebraic-and-transcendental-equations
_	UNIT V: Solution of Ordinary Differential Equations
5.	https://nptel.ac.in/courses/111107063/
	https://www.facweb.iitkgp.ac.in/~rajas/cgen/page/nptlcrs



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

Applied Chemistry

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

Course Category	Basic Sciences	Course Code	
Course Type	Theory	L-T-P-C	3 - 0 - 3 - 4.5
Prerequisites	Internet l'este	Internal Assessment	30
_	Chemistry	Semester End Examination	70
	Chemistry	Total Marks	100

COU	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					

COUF	COURSE OUTCOMES						
Upon	Upon successful completion of the course, the student will be able to: Cognitive Level						
CO1	To compare different types of batteries and explain the merits of fuel cell.	Understanding (K2)					
CO2	List out different renewable sources of energy.	Applying (K3)					
CO3	To explain the Green methods of Synthesis and applications of Green	Applying (K3)					
CO4	Analyze the importance of Polymers in engineering applications.	Understanding (K2)					
CO5	To Distinguish between Rotaxane and Catenane molecular machines	Analyzing (K4)					

Contr	ibution	of Cou	rse Out	tcomes	towards	s achiev	ement (of Prog	ram : O	outcomes	(1 – Low,	2 - Mediu	um, 3 – H	ligh)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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		



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURS	E CONTENT APPLIED CHEMISTRY SYLLABUS
UNIT I	ELECTROCHEMICAL ENERGY SYSTEMS9hrsElectrode 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 ElectroBatteries-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.Learning Outcomes: At the end of this unit, the students will be able to Apply Nernst Equation for Calculating Electrode Potentials Compare different batteries and their applications(L3) (L2)
UNIT II	ENERGY SOURCES AND APPLICATIONS8hrsIntroduction- Sources of renewable energySolar 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).Learning outcomes : After the completion of the Unit ,the student will able to List different renewable sources of energy.(L-1)Explain how photovoltaic cells convert light into energy. Illustrate the construction and working of PV cell.(L-2)
UNIT III	MATERIAL SCIENCE AND ENGINEERING7+5 hrsIII-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 Engineering Applications 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.Learning Outcomes: At the end of this unit, the students will be able to Classify Nano materials.(L-2)Explain the Synthesis and applications of Nano Materials.(L-2)Explain the band theory of solids for conductors semiconductors and insulators (L.2)
UNIT IV	POLYMER CHEMISTRY 10hrs 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. Learning Outcomes: At the end of this unit, the students will be able to Explain different types of polymers and their applications (L2) Demonstrate the mechanism of conduction in conducting polymers (L2) Instrumental Methods & Molecular Machines and Switches 9 hrs
UNIT V	A) Spectroscopic Techniques: Electromagnetic Spectrum- Introduction, Absorption of radiation: Beer-Lambert's law Principles of UV-Visible and IR Spectroscopic techniques and their



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

	Applications.
	B) Molecular Machines: Rotaxanes and Catenanes as artificial Molecular Machines.
	Molecular Switches: Introduction, Cyclodextrin based Switches.
	Learning Outcomes:
	At the end of this unit, the students will be able to
	Explain the concepts of artificial molecular machines and molecular switches. (L-3)
	Distinguish between rotaxane and catenane molecular machines . (L-2)
	Explain the different types of spectral series in electromagnetic spectrum (L2)
	Understand the principles of different analytical instruments (L2)
	Explain the different applications of analytical instruments (L2)
TEXT	Γ 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.
REFE	CRENCE 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
	Electrochemical Energy systems
1	https://en.wikipedia.org/wiki/Electrochemical_cell
2	Energy Sources and Applications
2	https://en.wikipedia.org/wiki/Hydropower
3	Material Science and Engineering
5	https://en.wikipedia.org/wiki/Nanomaterials
4	Polymer Chemistry
4	https://en.wikipedia.org/wiki/Polymer_chemistry
5	Instrumental Methods & Molecular Machines and Switches
5	https://en.wikipedia.org/wiki/Spectroscopy



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

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

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

COUR	SE 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 O	BTL	
Upon succes		
CO1	Apply the fundamentals of C Programming for Problem solving.	К3
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.	К3
CO4	design and implement programs to analyze the different pointer applications	К3
CO5	Develop solutions for problems using Files and Functions.	К3

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



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Cont	Contribution of Course Outcomes towards achievement of Program														
Outc	omes	(1 – L	ow, 2	- Med	ium, 3	8 – Hig	gh)								
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO 1	3	3	3	3	1	0	0	0	0	0	0	0	1	1	0
CO 2	3	3	3	3	1	0	0	0	0	0	0	0	1	1	0
CO 3	3	3	3	2	1	0	0	0	0	0	0	0	2	1	0
CO 4	2	3	3	3	1	0	0	0	0	0	0	0	2	2	0
CO 5	3	3	3	3	1	0	0	0	0	0	0	0	2	2	0

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 Type Qualifiers. 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, Multiway Selection, 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, Memory Allocation 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,



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

Formatting Input / Output Functions, Character Input / Output Functions Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

TE	XT 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.					
RE	FERENCE 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.					
WI	EB RESOURCES					
1.	http://nptel.ac.in/courses/106104128/					
2.	http://students.iitk.ac.in/programmingclub/course/#notes					
3.	http://c-faq.com/~scs/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/					



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

Computer Engineering Workshop

Course (Category	Engineering Science	Course Code									
Course 1	Гуре	Theory	L-T-P-C	1-0-4-3								
Prerequ	isites		Internal Assessment	30								
			Semester End Examination	70								
			Total Marks 100									
COURSE	OBJECTIVES70		L									
Skills and	d knowledge pro	ovided by this subject are the	ne following:									
1	PC Hardware: MS Windows,	Identification of basic perip device drivers, etc. Trouble	herals, Assembling a PC, Installation of sy shooting of PC Hardware and Software iss	stem softwar ues.	re like							
2	Internet & Wo workplace and forums. Aware the viruses), w	rld Wide Web: Different wa l effectively usage of the int eness of cyber hygiene (pro- vorms and other cyber attac	ays of hooking the PC on to the internet fr ternet, web browsers, email, newsgroups tecting the personal computer from gettir cks.	om home an and discussio g infected w	d on ⁄ith							
3	Productivity To spread sheets, tools.	ools: Understanding and pra power point presentations	actical approach of professional word doc and personal web sites using the Microso	uments, exce oft suite offic	اد e							
COURSE	OUTCOMES			Cogi	nitive							
Upon su	ccessful comple	etion of the course, the stu	dent will be able to:	le	vel							
CO1	Identify, assen	nble and update the compo	nents of a computer	k	(2							
CO2	Configure, eva	luate and select hardware	platforms for the implementation and	k	(3							
	execution of c	omputer applications, servi	ces and systems									
CO3	Make use of to	ools for converting pdf to w	ord and vice versa	k	<2							
CO4	Develop presentation, documents and small applications using productivity tools such as word processor, presentation tools, spreadsheets, HTML, LaTexK3											

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



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Conti (1 – L	ributio ow, 2	on of Co - Mediu	ourse O um, 3 –	utcome High)	es towa	rds ach	ieveme	ent of P	rogram	1 Outco	mes				
•	-		-												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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 CO	INTENT
Task 1	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.
Task 2	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/IP setting and demonstrate how to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and pop up blockers)
Productivit	y 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,



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

	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.,
Task 12	Demonstration and Practice of various features LaTeX – document preparation, presentation (Features covered in Task 9 and Task 11 need to be explored in LaTex)
Task 13	Tools for converting word to pdf and pdf to word
Task 14	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



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

- 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



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

Subject Code:

DEPARTMENT OF ENGLISH

L	Т	Ρ	С
0	0	3	1.5

Professional Communicative English Lab

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 students become successful in the competitive world.

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

UNIT 1:

Introduction Consonant Sounds Vowel Sounds

UNIT 2:

Rhythm and Pronunciation Weak/strong and contrasted forms Practice of Rhythm



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

UNIT 3:

Dialogues

UNIT 4:

Group Discussions

UNIT 5:

Presentations & Public Speaking

UNIT-6:Interviews

Course Outcomes

со	Description	COGNITIVE LEVEL
CO1	Understand different speech sounds and maintain proper pronunciation and rhythm in day to day conversations.	К2
CO2	Interpret and respond appropriately in various day to day contexts and improves techniques in group discussions.	К5
CO3	Develop the required communication skills to deliver effective presentations and interviews with clarity and impact.	К6

K1- Remembering, K2- Understanding, K3-Applying, K-4 Analyzing, K5- Evaluating, K6- Creating



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

	PO	РО	РО	PO	PO	PO	РО	РО	РО	РО	РО	РО	PSO	PSO	PSO
СО	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-

APPLIED CHEMISTRY LAB

Course Category	Basic sciences	Credits:	1.5
Course Type	Lab	Lecture-Tutorial-Practice:	0 -0 -3
Prerequisites	Basic Chemistry	Continuous Evaluation:	25
		Semester end Evaluation:	50
		Total Marks:	75

COUR	SE OUTCOMES	
Upon	successful completion of this course, the student will be able to:	Cognitive Level
CO1	estimate the given amount of dissolved compounds in a solution by using volumetric analysis and preparation of polymers and nano particles	Applying(K3)
CO2	determine the concentration of different metal ions present in water by complexometric titrations.	Understanding(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.	Evaluating (K5)

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

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PSO2
CO1	2	1	2											



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO2	2	1	1					
CO3	2	1						

COURSE CONTENT
(Any 10 of the following listed 13 experiments)
LIST OF EXPERIMENTS:
Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis
1.Estimation of HCI using standard Na ₂ CO ₃ solutions
2.Determination of alkalinity of a sample containing Na ₂ CO ₃ and NaOH
3.Estimation of KmnO ₄ using standard Oxalic acid solution.
4.Estimation of Ferrous iron using standard K ₂ Cr ₂ O 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)
TEXTBOOKS
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. Rhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e. Dhannat Rai Publishing REFERENCEBOOKS
Vogel's Textbook of Quantitative chemical analysis, J. Mendham et.al.
[1] College designed manual
WEB-RESOURCES
www.bsauniv.ac.in/UploadImages/Downloads/Estimation%20of%20Hardness



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

Programming for Problem solving using C Lab

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

Course Category	Engineering Science	Course Code	
Course Type	Laboratory	L-T-P-C	0-0-3-1.5
Prerequisites		Internal Assessment	30
		Semester End Examination	70
		Total Marks	100

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	COURSE OUTCOMES						
Upon su	Upon successful completion of the course, the student will be able to:						
CO1	Knowledge on various concepts of a C language.	КЗ					
CO2	Draw flowcharts and write algorithms.	К3					
CO3	Design and development of C problem solving skills.	К3					
CO4	Design and develop modular programming skills.	К3					

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	0	0	0	0	0	0	0	2	2	0
CO2	3	3	3	3	1	0	0	0	0	0	0	0	2	2	0
CO3	3	3	3	3	1	0	0	0	0	0	0	0	2	2	0



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE CON	ITENT
	Exercise 1:
1.	 Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
2	3. Write a C program to display multiple variables.
Ζ.	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 r and 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 the various 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.
	 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:
	 Write a program in C to search an element in a row wise and column wise sorted matrix.
	2. Write a program in C to print individual characters of string in reverse order.



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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:
	 Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
	2. Write a program in C to demonstrate how to handle the pointers in the program.
10.	Exercise 10:
	 Write a program in C to demonstrate the use of & (address of) and *(value at address) 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 Memory Allocation.
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
	a pointer.
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 this program, allocate memory dynamically using malloc() function.
14.	Exercise 14:
	 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 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 not using the function.
	2. Write a program in C to get the largest element of an array using the function.



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

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.

Environmental Sciences

(Common to CE, ME, ECE, CSE, CSEDS&AI, IT)

Course Category	Basic Sciences	Course Code	20BE1MC01
Course Type	Theory	L-T-P-C	3-0-0-0
Prerequisites	Basic Knowledge in Environment and protection.	Internal Assessment Semester End Examination Total Marks	0 0 0

COURSE OBJECTIVE:											
	To make the students to get awareness on environment, to understand the										
1	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.										

COUR	SE OUTCOMES
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.
CO2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO4	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO5	Influence their society in proper utilization of goods and services.
CO6	Learn the management of environmental hazards and to mitigate disasters and have a clear understanding of environmental concerns and follow sustainable development practices

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



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	0	1	0	0	1	2	0	0	0	1	0	0	0
CO2	0	1	0	0	0	0	1	0	0	0	0	0	0	0
CO3	0	0	0	0	2	0	1	0	0	0	0	0	0	0
CO4	0	0	0	0	1	1	3	0	0	0	0	0	0	0
CO5	0	0	0	0	0	0	3	1	0	0	0	0	0	0

R20- B.Tech – CSE (DATA SCIENCE)

Course contents:

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-pesticide problems.

Energy resources: renewable and nonrenewable energy sources.

Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

LEARNING OUTCOMES:

Students will be able to

Articulate the basic structure, functions, and processes of key social systems affecting the environment Explain why renewable and non-renewable energy resources are important. Explain how water resources should be used.

UNIT-II

Ecosystems, Biodiversity and its conservation

Definition of Ecosystem and its structure, Functions BiodiversityDefinition-Valueofbiodiversity,Indiaasamega-diversitynation,Threatsto biodiversity,Conservationofbiodiversity,<u>EndangeredandendemicspeciesofIndia</u>.

LEARNING OUTCOMES:

Students will be able to

Get a clear picture of structure and functions of ecosystems.



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

Demonstrate knowledge and understanding of theories in the field of Biodiversity and Systematic in the broad sense. Explain endangered and endemic species of India.

UNIT III

Environmental Pollution and Solid Waste Management

Definition, Cause, Effects of Air pollution, Water pollution, Noise pollution, Radioactive pollution, Role of an individual in prevention of pollution. SolidWasteManagement:Sources,effectsandcontrolmeasuresofurbanandindustrial waste, <u>e-waste management</u>

LEARNING OUTCOMES

Students will be able to

Understand Cause, effects and control measures of air pollution. Understand solid 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-<u>case studies</u>

LEARNING OUTCOMES:

Students will be able to

Explain the enforcement of Environmental legislations Acquire knowledge on various environmental challenges induced due to unplanned anthropogenic activities. Explain the reasons for global warming

UNIT-V

Human population and the Environment

Population growth, Women and child welfare, Role of Information technology in environment and 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 of project by every student)

LEARNING OUTCOMES

Students will have

Explain various types of information



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

technologies Explain the theories of population explosion Acquire knowledge on various environmental challenges induced due to unplanned anthropogenic activities

DEPARTMENT OF ENVIRONMENTAL SCIENCES

TE	XT BOOKS
1.	Environmental Studies for undergraduate courses by ErachBharucha.UGC.
	A Textbook of Environmental Studies by Dr.S.AzeemUnnisa.Acadamic
2.	publishing company.
_	Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K.
3.	Manjula Rani; Pearson Education, Chennai
RE	FERENCE BOOKS
1	Text Book of Environmental Studies by Deeshita Dave & P. UdayaBhaskar,
1.	Cengage learning.
2	Glimpses of Environment by K.V.S.G. Murali Krishna Published by
Ζ.	Environmental Protection Society, Kakinada, A.P.
3.	Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi
	Environmental Studies by PiyushMalaviya, Pratibha Singh, Anoopsingh:
4.	Acme Learning, New Delhi.
	An Introduction to Environmental Pollution by Dr.B.k.Sharma AND Dr.(Miss)H.kaur,Goel
5.	publishing House ,a unit of Krishna Prakasham Media
	(p) LH,Meerut –India
W	EB RESOURCES
	UNIT-1: MULTI DISPLINARY NATURE OF ENVIRONMENT and NATURAL RESOURCES
1	http://www.defra.gov.uk/environment/climatechange
	https://www.climatesolutions.org
	https://en.wikibooks.org/wiki/Ecology/Ecosystems
	UNIT-2:ECOSYSTEM, BIODIVERSITY AND ITS CONSERVATION
	http://conbio.net/vl/ and www.biodiversitya-z.org/content/biodiversity
2	
-	
	bttns://www.omicsonline.org/onvironment.pollution.climate.change.php.apd
3	https://www.onnesonne.org/environment-politicion-climate-change.php and
	intips.//www.britannica.com/technology/solid-waste-management
•	
	UNIT-4: SOCIAL ISSUES AND THE ENVIRONMENT
	http://www.publichealthnotes.com/solid-waste-management/
4	
•	



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

UNIT-5: HUMANPOPULATION AND THE

NVIRONMENT<u>http://www.ecoindia.com/education/water-</u>

5 conservation.htmlhttps://thewaterproject.org/water_conservation\https://legalcareerpath

.com/what-is-environmental-law/



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

	I-II						
S No	Cotogowy	Course	Course Title	Hours per week			Credits
3.110	Category	Code	Course The	L	Τ	Р	С
1	BS		Linear Algebra and Partial Differential Equations	3	0	0	3
2	BS		Applied Physics	3	0	0	3
3	ES		Digital Logic Design	3	0	0	3
4	ES		Python Programming	3	0	0	3
5	ES		Data Structures	3	0	0	3
6	BS		Applied Physics Lab	0	0	3	1.5
7	ES		Python Programming Lab	0	0	3	1.5
8	ES		Data Structures Lab	0	0	3	1.5
9	9 MC Constitution of India		2	0	0	0	
	Total Credits170919.5				19.5		



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

I Year II Semester

Linear Algebra and Partial Differential Equations (Common to CE, ME, ECE, CSE, IT, CSE-DS, CSE-AI&ML)

I B. Tech II Semester

Course Category	Basic Sciences	Course Code	
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	Basics of Matrices,	Internal Assessment	30
	Differentiation,	Semester End Examination	70
	integration	Total Marks	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.		
	The skills derived from the course will help the student form a necessary base to		
2	develop analytic and design concepts.		

COURSE	COURSE OUTCOMES			
Upon su	Cognitive Level			
CO1	solve systems of linear equations, determine the rank, find the eigenvalues and eigenvectors, diagonalization of a matrix.	К3		
CO2	identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics.	К2		
CO3	find areas and volumes using double and triple integrals	К2		
CO4	find partial derivatives of multivariable functions and apply them to find extreme values of a function.	К3		
CO5	apply a range of techniques to find solutions of standard PDEs	К3		

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



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Contri Outco	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	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-

COURSE COI	NTENT
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 and non- 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).



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

	Partial Differential Equations and Applications
UNIT V	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.

TEX	T BOOKS
1.	B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India
REF	ERENCE 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

WE	B RESOURCES
	UNIT I: Solving system of linear equations, Eigen Values and Eigen vectors
1.	https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
	UNIT II: Cayley-Hamilton Theorem and Quadratic forms
2.	https://www.math.hmc.edu/calculus/tutorials/eigenstuff/
	https://en.wikipedia.org/wiki/Quadratic_form
3.	UNIT III: Multiple Integrals



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

	https://en.wikipedia.org/wiki/Multiple_integral
	http://tutorial.math.lamar.edu/Classes/CalcIII/MultipleIntegralsIntro.aspx
	UNIT V: Partial Differentiation
4.	https://en.wikipedia.org/wiki/Partial_derivative
	https://www.whitman.edu/mathematics/calculus_online/section14.03.html
_	UNIT V:Partial Differential Equations and Applications
5.	https://en.wikipedia.org/wiki/Partial_differential_equation



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

APPLIED PHYSICS

CourseCategory	BASICSCIENCES	Course Code	
Course Type	Theory	L-T-P-C	3-0-0-3
Prerequisites	IntermediatePhysics	Internal Assessment SemesterEndExamination TotalMarks	30 70 100

COURS	COURSE OBJECTIVES			
1	ImpartKnowledgeofPhysicalOpticsphenomenalikeInterferenceandDiffractionrequiredtodesigninstrume ntswithhigherresolution.			
2	Imparttheknowledgeof Lasers, Optical Fibers and their implications in optical communications.			
3	Toexplainthesignificantconceptsofdielectricandmagneticmaterialsthatleadstopotential applicationsinemerging microdevices.			
4	$\label{eq:constraint} To explain the concepts of Quantum Mechanics and free electron theories for study of metals and semiconductors.$			
5	Understand the formation of bands in Semiconductors and their working mechanism for their utility in Engineering applications			

COURS	CognitiveLevel		
Uponsu			
CO1	$\label{eq:constraint} Analyze the optical application susing the concepts of Interference and diffraction.$	Analyze(K4)	
CO2	Apply the basics of Laser Mechanism and fiber optics for the communicationssystems.	Applying(K3)	
CO3	Apply the basics of phenomenon related to dielectric materials and MagneticMaterialstostudytheirdependenceontemperatureandfrequencyresponse.	Applying(K3)	
CO4	Understand the concepts of quantum mechanics for calculation of free quantumparticleenergiesandphenomenonofelectrical&thermal conductivitiestosub microscopicparticles.	Understanding(K2)	
CO5	UnderstandtheBandformation, electrical conductivities insemiconductors and study the types of semiconductors using Hall Effect.	Understanding(K2)	



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Cont	ContributionofCourseOutcomestowardsachievementof Program														
Outc	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	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	2	-	-	-

COURSECON	ITENT	
UNITI	WAVEOPTICS (10hrs) INTERFERENCE Introduction-PrincipleofSuperposition-CoherentSources-Interferenceinparallelthinfilm(reflectiongeometry)- Newton'srings, Determination ofWavelengthandRefractiveIndex& Applications.)
	DIFFRACTION Introduction-Typesofdiffraction-Fraunhofferdiffractionduetosingleslit, Doubleslit, NSlits (Qualitative) - Rayleigh criterion of resolution and Resolving power of grating (Qualitative).	
	(8hrst) Introduction-Characteristics-SpontaneousandStimulatedemissionofradiation-populationinversion-PumpingSchemes-Rubylaser- HeliumNeonlaser-Applications	;)
	FIBEROPTICS: Introduction-Structure&PrincipleofOpticalFiber-NumericalApertureandAcceptanceAngle- classificationofOpticalfibersbasedonRefractiveIndexProfileandModes-BlockDiagramofopticalfibercommunicationsystem- AdvantagesofOpticalfibers-Applications.	
	MAGNETICSPROPERTIES (12h	rs)
UNITIII	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(Qualitative Treatment)-Hysteresis-B-HCurve-softandhardmagneticmaterials&applications DIELECTRICS	
	Introduction - Dielectric polarization – Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations- ElectroniclonicandOrientationpolarizations(qualitative) –LorentzInternalfield –Claussius-Mossotiequation- Applicationsofdielectrics.	
	QUANTUMMECHANICS	
	(9	hr
UNITIV	Introduction–Matterwaves–deBroglie's hypothesis–Interpretation of wavefunction– Schrödinger TimeIndependent and TimeDependent wave equations–Particle in a potential box	
	FREELECTRONTHEORY	
	Classical Free Electron Theory(Qualitative with discussions of merit and demerits)-Quantum Free Electron Theory- Equation ofconductivitybasedonquantumfreeelectron theory-Fermi DiracDistribution-DensityofStates-Fermi Energy	
	BANDTHEORYOFSOLIDS (9hrs)	
	Bloch's Theorem(Qualitative)-Kronig Penny Model(Qualitative)-E vs K diagram-V vs K diagram, Effective mass of electron- ClassificationofCrystallineSolids-Conceptofhole	
UNITV	SEMICONDUCTORPHYSICS	
	Introduction–Intrinsic Semi conductors - density of charge carriers- Electrical conductivity – Fermi level – extrinsic semiconductors -p-type&n-type-Densityofchargecarriers-DriftandDiffusioncurrents-Einstein'sEquation-Halleffect-ApplicationsofHalleffect	



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

-	
1.	EngineeringPhysicsbyM.N.Avadhanalu,P.G.Kshirsagar&TV SArun Murty,SChandPubication,11 th Edition2019
2.	"EngineeringPhysics" by M.R. Srinivasan, New Age international publishers
3.	EngineeringPhysicsbyP.KPalanisamy,SciTechPublication
REFI	ERENCEBOOKS
1.	KettlesIntroductionto Solid statePhysics-CharlesKittel,WileyIndiaEdition
2.	SolidStatePhysics,AJDekker,I Edition,MacmillanPublishersIndiaPrivateLimited
3	"SolidStatePhysics" by SOPilai., - NewageInternationalPublishers
4.	EngineeringPhysicsbyDKBhattacharyaandPoonamTandon,OxfordPress(2018)
WEB	RESOURCES
1.	https://nptel.ac.in/courses/122/107/122107035/# https://nptel.ac.in/courses/122/107/122107035/#
	https://pragatiengg.org/pluginfile.php/29143/mod_folder/content/0/UNIT%20IV%20LASERS%20.pptx?forcedownload=1https://nptel.ac.in/courses/
2.	104/104/104104085/ https://nptel.ac.in/courses/115/107/115107095/
3.	https://nptel.ac.in/courses/113/104/113104090/ https://youtu.be/DDLljK1ODeg
	https://study.com/academy/lesson/the-de-broglie-hypothesis-definition- significance.htmlhttps://nptel.ac.in/courses/115/101/115101107/
4.	https://nptel.ac.in/courses/115/105/115105122/
	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/
5.	



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

DIGITAL LOGIC DESIGN (CSE-AI & ML, CSE-Data Science) I Year II Semester

Course Objectives:

- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, theory of Boolean algebra and map method for minimization of switching functions.
- To introduce the basic tools for design of combinational and sequential digital logic.
- To learn simple digital circuits in preparation for computer engineering.

Course outcomes:

A student will be able to:

CO1	Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
CO2	Understand the different switching algebra theorems and apply them for logic functions and Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
CO3	Design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
CO4	Design various sequential circuits starting from flip-flop and conversion of flipflops.
CO5	Design registers, shift registers, synchronous counters and ring counters.

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														
CO2														
CO3														
CO4														
CO5														

UNIT I:

Digital Systems and Binary NumbersDigital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3,alphanumeric codes, 9's complement, 2421, etc.

UNIT II:



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

Concept of Boolean algebra: Basic Theorems and Properties of Boolean algebra, BooleanFunctions, Canonical and StandardForms, Minterms and Maxterms.Gate level MinimizationMap Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification,Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation,ExclusiveOR Function.

UNIT III:

Combinational Logic: Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders,Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, MagnitudeComparator, HDL Models of Combinational Circuits. Realization of Switching Functions Using PROM, PAL and PLA.

UNIT IV:

Synchronous Sequential LogicIntroduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch UsingNAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

UNIT V: Registers and CountersRegisters, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, JohnsonCounter.

Text Books:

1) Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.

2) Fundamentals of Logic Design, 5/e, Roth, Cengage.

Reference Books:

1) Digital Logic and Computer Design, M.Morris Mano, PEA.

2) Digital Logic Design, Leach, Malvino, Saha, TMH.

3) Modern Digital Electronics, R.P. Jain, TMH.



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

PYTHON PROGRAMMING

(Common to CSE and IT)

Course Category	Engineering Science	Course Code	
Course Type	Theory	L-T-P-C	2-0-2-3
Prerequisites	Exposure to	Internal Assessment	30
	Programming for Problem Solving	Semester End Examination	70
	using C	Total Marks	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 OUT	BTL	
Upon succes		
CO1	Develop essential programming skills in computer programming concepts like data types, containers	КЗ
CO2	Apply the basics of programming in the Python language	К3
CO3	Solve coding tasks related conditional execution, loops	К3
CO4	Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming	КЗ
CO5	Develop Python programs using file concepts.	К3

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



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Contr	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	0	0	0	0	0	0	1	3	3	2
CO2	3	2	1	1	1	0	0	0	0	0	0	1	3	3	2
CO3	3	2	1	1	1	0	0	0	0	0	0	1	3	3	2
CO4	3	2	2	3	3	0	0	0	0	0	0	1	3	3	2
CO5	3	2	2	3	3	0	0	0	0	0	0	1	3	3	2

COURSE CO	NTENT
UNIT I	 Conceptual introduction: topics in computer science, algorithms; modern computer systems: hardware architecture, data representation in computers, software and operating system; installing Python; basic syntax, interactive shell, editing, saving, and running a script. The concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages.
	Conditions, boolean logic, logical operators; ranges;
	Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation
UNIT II	Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated). String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers
	Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element;
UNIT III	searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.
	Design with functions : hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions.
	File Operations: Reading config files in python, Writing log files in python, Understanding
UNIT IV	read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(). Manipulating file pointer using seek. Programming using file operations



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

	Classes and OOP : classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects
UNIT V	 OOP, continued: inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; exception handling, try block Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames Multithreading, Networks, and Client/Server Programming; introduction to HTML, interacting with remote HTML server, running html-based queries, downloading pages; CGI programming, programming a simple CGI form.

TEX	T BOOKS
1.	Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2.	Python Programming: A Modern Approach, Vamsi Kurama, Pearson
REF	ERENCE BOOKS
1.	Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
2.	Programming and Problem Solving with Python, Ashok Namdev Kamthane, Amit Ashok Kamthane, TMH, 2019.
WE	B RESOURCES
1.	http://nptel.ac.in/courses/106104128/
2.	http://students.iitk.ac.in/programmingclub/course/#notes
3.	http://c-faq.com/~scs/cclass.html
4.	https://www.tutorialspoint.com/python3/python_tutorial.pdf
5.	http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical-programming- in-c-january-iap-2010/



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

Data Structures

Course (Category	Engineering Science	Course Code					
Course 1	Гуре	Theory	L-T-P-C	3-0-0-3				
Prerequ	isites		Internal Assessment	30				
	Semester End Examination 70							
			Total Marks	100				
COURSE	OBJECTIVES							
The obje	ective of the cou	rse is to						
1	Introduce the	fundamental concept of da	ta structures and abstract data types					
2	Emphasize the	e importance of data structu	ures in developing and implementing effici	ent algorithms				
3	Describe how memory and u	arrays, records, linked struc used by algorithms	ctures, stacks, queues, trees, and graphs a	re represented in				
COURSE	OUTCOMES			Cognitive				
Upon su	ccessful comple	etion of the course, the stu	dent will be able to:	level				
CO1	Summarize the	e properties, interfaces, and	d behaviors of basic abstract data types	К2				
CO2	Discuss the c searching	omputational efficiency of	of the principal algorithms for sorting &	к К2				
CO3	Use arrays, records, linked structures, stacks, queues, trees, and Graphs in K3 writing programs							
CO4	Demonstrate	different methods for trav	versing trees	К2				
CO5	Implement algorithms on Graphs K3							

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

Contri (1 – Lo	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



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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

COU	IRSE CON	ITENT				
U	NIT 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.				
UI	NIT 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.				
U	NIT 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.				
		Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph				
U	NIT V	Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.				
TEX	T BOOKS					
1.	1. Data Structures Using C. 2 nd Edition. Reema Thareja, Oxford.					
2.	Data Str	ructures and algorithm analysis in C, 2 nd ed, Mark Allen Weiss.				
REFE	REFERENCE BOOKS					



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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				
WE	B RESOURCES				
1.	http://algs4.cs.princeton.edu/home/				
2.	https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf				



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

APPLIED PHYSICS LABORATORY

Course Category	BASIC SCIENCES	Course Code	
Course Type	Lab	L-T-P-C	0 -0-3-1.5
Prerequisites		Internal Assessment	30
	Intermediate Physics	Semester End Examination	70
		Total Marks	100

COURS	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								

COURS	Cognitive Level	
Upon s	uccessful 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.	Understanding(K2)
CO2	Determine the Magnetic and Dielectric constants of materials.	Application(K3)
CO3	Apply the basics of Current Electricity and Semiconductors in engineering Application	Application(K3)

Cont	Contribution of Course Outcomes towards achievement of Program														
Outc	Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	I	-	-	-	-	-	I	I	-	I	I	-	-	-
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.						



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

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.

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



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

PYTHON PROGRAMMING LAB

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

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

COURS	SE 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

COURS	SE OUTCOMES	BTL
Upon su	accessful completion of the course, the student will be able to:	
CO1	Write, Test and Debug Python Programs and Use Conditionals and Loops for Python Programs	Analyzing
CO2	Use functions and represent Compound data using Lists, Tuples and Dictionaries	Applying
CO3	Use various applications using python	Applying

Con	Contribution of Course Outcomes towards achievement of Program														
Out	Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO	3	2	1	1	1	0	0	0	0	0	0	2	3	3	2
1															
CO	3	2	1	1	1	0	0	0	0	0	0	2	3	3	2
2															
CO	3	2	1	1	1	0	0	0	0	0	0	2	3	3	2
3															



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

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 how high 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 numbers are 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 word contains 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.



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

- 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 how many factors the number has.
- 20) Write a function called *is_sorted*that is given a list and returns True if the list is sorted 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 first n primes. Let the default value of n be 100.
- 23) Write a function called merge that takes two already sorted lists of possibly different 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 called ftemps.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



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

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 when declaring 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. The program 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.



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

Data Structures Laboratory

Course (Category	Engineering Science	Course Code								
Course 1	Гуре	Laboratory	L-T-P-C	0-0-3	-1.5						
Prerequ	isites		Internal Assessment	30							
			Semester End Examination	70							
			Total Marks	100							
COURSE OBJECTIVES											
1	The objective	of this lab is to demonstrat	e the different data structures implementa	ition.							
COURSE	OUTCOMES				Cognitive						
Upon su	ccessful comple	etion of the course, the stu	dent will be able to:		level						
CO1	Use basic data	structures such as arrays a	nd linked list.		К3						
CO2	Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.										
CO3	Use various searching and sorting algorithms.										

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

Contr	ibutio	n of Co	urse O	utcom	es tow	ards ac	hievem	nent of	Progra	m Outco	omes				
(1 – L	(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



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CO3	2	3	1	1	1	-	-	-	-	-	-	-	1	1	1

COURSE CONTE	NT
Exercise -1 (Searching)	a) Write C program that use both recursive and non recursive functions to perform Linear search 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 ascending order b) Write C program that implement Quick sort, to sort a given list of integers in ascending order 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 ascending order 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 linked list 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 BSTb) Write a C program to insert a node into a BST.c) Write a C program to delete a node from a BST.



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

	Constitution of	India	
CourseCategory	Humanities including Management	Credits	0
CourseType	Theory	Lecture-Tutorial-Practice	2 -0 -0
Prerequisites		Total Marks (Internal Assessment)	100

	Course Outcomes	Blooms
On suc	cessfulcompletion of the course, the student will be able to	Taxonomy Level
CO 1	Understand the evolution of Constitution of India	Understanding
CO 2	Make use of one's Fundamental rights.	Application
CO 3	Understand the functioning of the Union Government	Understanding
CO 4	Understand the functioning of the State and local self Government.	Understanding
CO 5	Understand the value of Indian Constitution in functioning of the country.	Understanding

	Contribution of Course Outcomes towards achievement of Program														
			Ou	tcome	s: 1 – L	.ow, 2 -	Mediu	ım, 3 –	High						
	PO PO<										PO				
	1	2	3	4	5	6	7	8	9	10	11	12			
CO1	0	0	0	0	0	3	0	3	0	1	0	2			
CO2	0	0	0	0	0	1	0	2	1	1	0	1			
CO3	0	0	0	0	0	1	0	1	1	1	0	0			
CO4	0	0	0	0	0	1	0	1	1	1	0	0			
CO5	0	0	0	0	0	1	1	1	1	1	0	2			



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

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 and Local self Government:

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 Working of the Indian Constitution

The values of the Indian Constitution and Ushering of Social Revolution in India – Nature and Role of Higher Judiciary in India – Amendments (Recent)



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R20- B.Tech – CSE (DATA SCIENCE)

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. <u>https://www.civilserviceindia.com/subject/General-Studies/notes/functions-and-responsibilities-of-the-union-and-the-states.html</u>

3. https://www.tutorialspoint.com/indian_polity/indian_polity_how_constitution_works