

**B.TECH - ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
CURRICULUM**

Semester II										
Course Code	Course Title	Category	Periods/Week				C	Maximum Marks		
			L	T	P	S		CIA	ESE	Total
Theory										
FLC11XX	Language Elective	HS	3	0	0	3	3	40	60	100
GEA1102 / GEA1103	Engineering Physics / Engineering Chemistry	BS	2	1	0	3	3	40	60	100
ADI1151/ AGI1151	Foundations of Python Programming and SQL (KRCT-2023 R)\nFoundations of Python Programming and SQL(KRCT-2024 R onwards)	PC	2	1	0	3	3	40	60	100
GEA1104 / GEA1105	Universal Human Values (MKCE,KRCE) / Engineering Graphics	HS	3	0	0	3	3	40	60	100
		Es	2	1	0	1	3	40	60	100
ADI1111/ ADI1131/ ADI1152/ AGI1152	Python Programming for Data Science(MKCE)\nPython Programming for Data Science(KRCE)/ Python Programming for Data Science(KRCT-2023 R)/Python Programming for Data Science(KRCT-2024 R onwards)	PC	3	0	0	3	3	40	60	100
Theory Cum Project/Practical Cum Theory										
CGB1122	Data Structures	PC	2	0	4	2	4	50	50	100
GEA1121	Engineering Mathematics II	BS	2	1	2	3	4	50	50	100
Practical										
ADI1112/ ADI1132/ ADI1153/ AGI1153	Python Programming for Data Science Laboratory(MKCE)\nPython Programming for Data Science Laboratory(KRCE)\nPython Programming for	PC	0	0	2	0	1	60	40	100

	Data Science Laboratory(KRCT-2023 R)\ Python Programming for Data Science Laboratory(KRCT-2024 R onwards)									
GEA1111 / GEA1112	Engineering Physics Laboratory / Engineering Chemistry laboratory	BS	0	0	2	0	1	60	40	100
Mandatory/Employability Enhancement										
GEA1123	Career Skill Development I	HS	1	0	0	1	1	40	60	100
GEA1122	Tamils and Technology (தமிழரும் தொழில்நுட்பமும்)	HS	1	0	0	1	1	40	60	100
Total Credits							24			

Course Code	Course Title	Sem	Category	Periods / Week				C
				L	T	P	S	
FLC1187	Basic Spanish	II	g	3	0	0	3	3
Pre-requisite	Nil	Course Type	Theory	QP TYPE				QP1
Course Objectives: To inculcate the practice of communicating in Spanish with basic vocabulary and make students adapt to the Spanish cultural aspects.								
Course Outcomes: Upon completion of the course, the students will be able to:								
CO	Course Outcomes:							
CO1	Remember greeting people, introducing oneself and understanding basic expressions in Spanish.							
CO2	Apply the correct use of Ser and Estar and tener verbs to describe people ,place and things.							
CO3	Ask Basic questions in spanish.							
CO4	Create opinion about people and places in regular verbs.							
CO5	Apply good comprehension of written discourse in areas of special interests.							
EL PROGRAMA DE LA CLASE								
Module I	¡HOLA!:SALUDOS Y DESPEDIDAS ; ABECEDARIO							9
El abecedario, Saludos y datospersonales, ¿como se dice enespañol?,lasfrasesbásicas, Númeroscardinales (1-10). RecursosGramaticales: Vocales, consonantes. Artículosdefinidos y indefinidos. Recursoscomunicativas: Saludar y Despedirse – aprender a presentarnos, ¿cómopreguntarcosasen la clase?								
Guided Self Study Topics								
Escribirdiezpalabras con artículosDeterminados y Indeterminados								
Module II	DATOSPERSONALES, RECURSOPARAPREGUNTARSOBRELASPALABRAS							9
Pronombrespersonales, El verbo ‘Ser’ enespañol, Nacionalidades, Países; Númeroscardinales (11 – 20), El verbo ‘Estar’, La diferencia entre ser y estar. El verbo ‘tener’, Edad y posesión.								

Guided Self Study Topics		
La profesión		
Module III	¿ESTUDIAS O TRABAJAS? DESCRIBIR LUGARES, EXPRESAR EXISTENCIA Y UBICACIÓN	9
Adjetivos, Vocabulario de mi habitación, colores, Números cardinales (20 – 100), Los Números ordinales(1-10), Los verbos regulares y irregulares -ar, -er, -ir, vocabulario básico. Recursos comunicativos – Escribe sobre mí mismo/a y los compañeros de la clase.		
Guided Self Study Topics		
Los Verbales -ar, - er, -ir		
Module IV	DÍA A DÍA	9
Los Interrogatorios, Adjetivos posesivos, Más Adjetivos en Español, verbos regulares y irregulares Recursos comunicativos- Mi habitación, mi ciudad.		
Guided Self Study Topics		
Los Interrogatorios		
Module V	MI FAMILIA, DIRECCIONES, EXPRESAR LA HORA	9
Mi familia, Direcciones, La hora .Recursos comunicativos- mi familia, pregunta a su amigo – pídele tiempo a tu amigo, más verbales irregulares de -er, - ir, Introducción a 'el tiempo'.		
Guided Self Study Topics		
Árbol de Familia		
Total Hours		45
Learning Resources:		
Text Books:		
1	Maria Angeles Palomino, “Chicos chicas nivel uno Libro Del Alumno 1 (Spanish) Paperback”, 2002.	
Reference Books:		
1	Gramática de uso del español – Teoría y práctica, Luis Argones y Ramón Palencia	
2	Short stories in spanish, published, 29/09/2022; Oilly Richards	
3	Modelos de examen Dele A1 (spanish edition) ,july 14,2020. Independently published. Spain.	

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
FLC1183	Grundstufe Deutsch (Basic German)	II	HS	3	0	0	3	3
Pre-requisite	Nil	Course Type	Theory	QP TYPE				QP1
Course Objectives:								
To practice German language for effectively communication of one's view with basic phrases.								
Course Outcomes:								
Upon completion of the course, the students will be able to:								
CO	Course Outcomes:							
CO1	Express and introduce oneself to others in German.							
CO2	Formulate simple sentences without grammatical errors.							
CO3	Make conversations with others using simple vocabulary.							
CO4	Form sentences in German on a variety of topics with significant precision and detail.							
CO5	Apply good comprehension of written discourse in areas of special interests.							
SYLLABUS								
Module I	HALLO!							9
Begrüssung, Landeskunde, Alphabet, Personalpronomen, Verben- heissen, kommen, wohnen, lernen, Zahlen (1-100), W-Fragen, Aussagesätze, Nomen- Singular und Plural, der Artikel -Bestimmter- UnbestimmterArtikel) Lernziel: SichVorstellen – Nationalitaetbenennen.								
Guided Self Study Topics								
Nomen (singular und Plural) mitArtikel								
Module II	PERSONEN, RAEUME UND GEGENSTAENDE							6
Nomen- Singular und Plural, der Artikel -Bestimmter- UnbestimmterArtikel), Konjugation der Verben (regelmässig /unregelmässig) LernZiel: Gegenstaende und Personenbenennen – zaehlen und rechnen.								
Guided Self Study Topics								
Verb konjugation								
Module III	DIE SPRACHSCHULE							6
Das Jahr- Monate, Jahreszeiten und die Woche, Hobbys, Ja-/Nein- Frage								

Imperativ mit „Sie“, Negation, Kasus (Bestimmter- Unbestimmter Artikel), richtung, Imperativ LernZiel: Orte erfragen und angeben – zahlenangaben bis 100 machen.		
Guided Self Study Topics		
Beschreiben ueber ein Thema		
Module IV	DIE SPRACHSCHULE CONT. – ARBEITSWELT	9
Berufe, Artikel, Zahlen (Hundert bis eine Million), Trennbare Verben, Modalverben, Präpositionen, Lebensmittel, Getränke und Essen, Farben, Tiere LernZiel: Berufe nennen und erfragen – Arbeitsplätze nennen und erfragen.		
Guided Self Study Topics		
Verschiedene Berufe nennen		
Module V	ADRESSEN UND KONTAKTE – FAMILIEN	9
Possessivpronomen – Buchstabieren – Kasus – direktobjektpronomen – Familienstand LernZiel: Woher Buchstabieren – Adressen angeben und erfragen – jemandem meine Telefonnummer geben und andere danach fragen – über meine Familie sprechen und andere danach fragen		
Guided Self Study Topics		
Hören		
Module VI	UHRZEIT	6
Uhrzeit – Übersetzung – sich vorstellen – Bundesländer in Deutschland – Ein Fest in Deutschland LernZiel: Nach der Uhrzeit fragen und die Uhrzeitsagen – über Öffnungszeiten sprechen – Termine vereinbaren		
Guided Self Study Topics		
Sprechen über Familie und selbst		
Total Hours		45
Learning Resources:		
Text Books:		
1	Stefanie Dengler, Paul Rusch, Helen Schmitz, Tanja Sieber, Klett-Langenscheidt Verlag, München: 2013.	
Reference Books:		
1	Lagune, Hartmut Auf der Strasse, Jutta Müller, Thomas Storz, 2012.	
2	Deutsche Sprachlehre für Ausländer, Heinz Griesbach, Dora Schulz, 2013.	
3	Studio d A1, Hermann Funk, Christina Kuhn, Cornelsen Verlag, Berlin, 2010.	
4	Tangram Aktuell-I, Maria-Rosa, Schoenherr Til, Max Hueber Verlag, München: 2012.	

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
FLC1181	PROFESSIONAL ENGLISH	II	HS	3	0	0	3	3
Pre-requisite	Technical English	Course Type	Theory (PMBL)	QP TYPE				QP1
Course Objectives:								
Course Outcomes:								
Upon completion of the course, the students will be able to:								
CO	Course Outcomes:							
CO1	Communicate effectively with the appropriate vocabulary.							
CO2	Respond to the professional conversations in the business world.							
CO3	Articulate the business communication in the Professional forum.							
CO4	Interpret information and data from technical reports.							
CO5	Construct flawless sentences for business correspondence.							
SYLLABUS								
Module I	GRAMMATICAL ASPECTS							9
Language development - Purpose Statement. Active voice and Passive voice, Embedded sentences, Reported speech, Conditional Clause, Types of Sentences (Simple. Compound and Complex), Idioms and Phrases. Vocabulary development: Single word substitute, Collocation, Homophones & Homonyms.								
Guided Self Study Topics								
Abbreviations and Acronyms								
Module II	ACADEMIC AND PROFESSIONAL LISTENING							9
Importance and Types - Listening to short formal and informal conversations - Listening to conversations and completing exercises based on them. Watching videos/documentaries/Listening to various interviews and assessing them – Listening and Responding to video lectures–TED talks.								
Guided Self Study Topics								
Listening to News channels								

Module III	ENRICHED SPEAKING SKILLS	9
Introducing oneself in the Interview - Mock Interview - Achieving confidence, clarity and fluency -Speaking in the interview following etiquette - Extempore- Short group conversations – Demonstrative speaking practice using Visual Aids.		
Guided Self Study Topics		
Speaking about a process (Any process based on real life situations)		
Module IV	READING AND UNDERSTANDING VISUAL ELEMENTS	9
Analyzing the case studies-Reading the Technical reports and note taking–Reading Comprehension–Decoding–Bionic reading- Reading longer texts –Reading articles from newspapers –Writing Tag lines.		
Guided Self Study Topics		
Reading Motivational stories.		
Module V	PROFESSIONAL WRITING	9
Cover Letter-Resume Preparation-Drafting Professional E-mails–Structure of a project-Report Writing-Writing Minutes of a meeting –Preparing Brochures, Pamphlets for various events – Writing Blogs		
Guided Self Study Topics		
Drafting E-mails for Professional Purposes.		
Total Hours		45
Learning Resources:		
Text Books:		
1	Meenakshi Raman and Sangeeta Sharma. “Technical Communication Principles and Practice”. New Delhi: Oxford University Press, 2022.	
2	Board of Editors. Using English - A Course book for Undergraduate Engineers and Technologists. Hyderabad: Orient Black Swan Pvt. Limited,2017.	
3	Jack C. Richards. Interchange Students’Book-2, New Delhi: CUP, 2021	
Reference Books:		
1	James Scofield and Anna Osborn, Collins Book for Business Speaking,2016	
2	Dutt P. Kiranmai and Ra Jeevan Geeta . Basic Communication Skills, Foundation Books, 2013.	
3	Mark Ibbotson, Professional English in Use, Cambridge University Press,2009.	

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
FLC1184	BASIC JAPANESE	II	HS	3	0	0	3	3
Pre-requisite	NIL	Course Type	Theory	QP TYPE				QP1
Course Objectives: To practice Japanese language for effectively communication of one's view with basic phrases.								
Course Outcomes: Upon completion of the course, the students will be able to:								
CO	Course Outcomes:							
CO1	Identify and use the Hiragana, Katakana and basic Kanji characters for expressing their views.							
CO2	Write and read the numbers, Days of the Months, Days of the week and time.							
CO3	Interpret the basic conversation between Two members in the Restaurants, Supermarkets, Hospitals etc.							
CO4	Appropriately use the KANJI characters based on the requirement while communicating.							
CO5	Ask and answer simple questions in Japanese.							
SYLLABUS								
Module I	INTRODUCTION TO HIRAGANA, NUMBERS, DAYS OF THE WEEK, TIME							9
Introduction of Japanese language and alphabets; Hiragana and katakana Reading and writing Hiragana and Katakana Characters, and Reading the MinnanoNihongo First 2 lessons Vocabulary.								
Guided Self Study Topics								
Write and practice Hiragana and Katakana								
Module II	GREETINGS, DAYS OF THE MONTH, COUNTERS OF ITEMS AND KATAKANA							9
Daily greetings and basic phrases to introduce yourself, Numbers 1 to 1 lakh, Days of the week, Days of the month, Basic counters of the items, Expressing the exact time, and								

MinnanoNihongo Third and Fourth lesson vocabulary.		
Guided Self Study Topics		
Start telling your Date of birth, Current day and Timing		
Module III	PARTICLES, VERBS, TENSE	9
Introducing about the particles and the usage of particles in the sentence. Positive and Negative expression of Verbs, Studying MinnanoNihongo 5 th and 6 th Lesson Vocabulary and all 6 lessons Grammar Points.		
Guided Self Study Topics		
Read short Stories		
Module IV	LISTENING SKILLS	9
Listening to the basic conversation between Two members in the Restaurants, Supermarkets, Hospitals etc. and identify the vocabulary, grammar expressions, Daily used formal greeting in Japanese, and Studying MinnanoNihongo 7 th and 8 th lesson Vocabulary.		
Guided Self Study Topics		
Listen to Conversation Audios and Videos		
Module V	ADJECTIVES, NOUN, AND KANJI	9
Usage of I and NA Adjective, Noun and their positive and negative expressions in the polite form, Identify the Kanji Character, Studying the grammar points and vocabulary of 9 th to 12 th lessons.		
Guided Self Study Topics		
Practice Kanji Characters		
Total Hours		45

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
ADI1151	Foundations of Python Programming and SQL	II	PC	2	1	0	3	3
Pre requisite	Data Structures	Course Type	Theory	QP TYPE				QP2
Course Objectives:								
To build a strong foundation in Python and gain a solid understanding of multithreading concepts, which are crucial throughout the program.								
Course Outcomes:								Max BTL
Upon completion of the course, the students will be able to:								
CO1	Recognize the advantages and benefits of using the python as programming language							2
CO2	Apply the principles and characteristics of object-oriented programming							3
CO3	Design and develop the various SQL queries including filtering, ordering and Operators							5/6
CO4	Explore the different SQL Functions such as String, Mathematical, Operators & date time pattern matching							4
CO5	Implement the Stored procedures and SQL triggers ensure the Trigger handling							3
Syllabus								Max BTL
Module I	Introduction to Python Programming 10							2
Data Types and Data Assignment-Operators & Strings Loops Control Statements-Function Types-Objects and Classes-Encapsulation-Access Modifiers Functional Programming Implementation								
Guided Self Study Topics								
Print the Star Sequence pattern-Fibonacci sequence								
Module II	Threading 9							3
Introduction to Threading-Introduction to Multithreading-Creating a New Thread-Synchronizing Threads Applications: Creating a Shopping App Using Python and Online Car Rental Platform								

Guided Self Study Topics		
Single Threaded Process-Multi Threaded Process-Task Queue		
Module III	Working with Database and Tables 9	5/6
Introduction to Database in MySQL-Storage Engine Types-Querying Table Data-Filtering Data from Tables. Creating and Managing Tables in MySQL-Operators: AND,OR,IN,LIMIT, BETWEEN, Comments in MySQL		
Guided Self Study Topics		
Create the Salary Database Table-Relational Database Model		
Module IV	Subqueries, Operators and Derived Tables in SQL 8	4
Aggregate Functions-Scalar Functions-Scalar Functions- Date and Time Functions Introduction to JOINS-Subqueries with Statements and Operators- EXISTS Operator		
Guided Self Study Topics		
Entity Relationship Components-Extended Entity Relationship		
Module V	Stored Procedures and Triggers in SQL 9	3
Introduction to Stored Procedures-Working and Advantages of Stored Procedures-Compound Statements & Conditional Statements Error Handling in Stored Procedures- Terminating Stored Procedures and Loops-Stored Functions in Stored Procedures-SQL Trigger		
Guided Self Study Topics		
DDL Triggers and Statement-CLR Triggers		
Total Hours		45
Learning Resources:		
Text Books:		
1	Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O'Reilly Publishers, 2016	
2	Karl Beecher, “Computational Thinking: A Beginner's Guide to Problem Solving and Programming”, 1st Edition, BCS Learning & Development Limited, 2017.	
Reference Books:		
1	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Seventh Edition, McGraw Hill, 2020	
2	Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021	
3	Eric Matthes, “Python Crash Course, A Hands - on Project Based Introduction to Programming”, 2nd Edition, No Starch Press, 2019.	

Course Code	Course Title	Sem	Category	Periods/week				C
				L	T	P	S	
GEA1104	UNIVERSAL HUMAN VALUES	II	HS	3	0	0	3	3
Pre-requisite	Nil	Course Type	Theory	QP TYPE				QP1
Course Objectives								
This course induces the essence of morality for being human and to facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.								
Course Outcomes								
Upon completion of the course, the students will be able to:								
CO1	Explore holistic vision of life - themselves and their surroundings.							
CO2	Develop competence and capabilities for maintaining Health and Hygiene							
CO3	Solve various problems in life, family, Society and in handling problems with Sustainable Solutions.							
CO4	Transform themselves to co-exist with nature by realising interconnectedness and four order of nature							
CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.							
Syllabus								
Module I	Introduction to value education							9
Need and basic guidelines of value education – content and process of value education – self exploration – purpose of self-exploration – content and process of self-exploration, continuous happiness and prosperity – the basic human aspirations, happiness and prosperity – current scenario, method to fulfil the basic human aspirations.								
Self Study Topics								
Holistic vision of life								
Module II	Harmony in the self and body							9
Human being and body – understanding myself as co–existence of self ('I') and body, needs of the self and body, self ('I') as the conscious entity, the body as the material entity – body as an instrument– activities in the self and body – exercise – harmony in the self ('I') – understanding myself – harmony with body.								
Self Study Topics								

Having competence and capabilities for maintaining health and hygiene.		
Module III	Harmony in the family and society	9
Harmony in the Family – Justice – Feelings (Values) in Human Relationships – Relationship from Family to Society – Identification of Human Goal – Five dimensions of Human Endeavour.		
Self Study Topics		
Socially responsible behaviour		
Module IV	Harmony in nature and existence	9
Order of nature – interconnectedness – understanding the four order – innateness – natural characteristic – basic activity – conformance – introduction to space – co – existence of units of space – limited and unlimited – active and no–activity – existence is co–existence.		
Self Study Topics		
Human goals – at the level of nature and existence		
Module V	Implication of the holistic understanding	9
Values in different dimensions of human living – definitiveness of ethical human conduct – implications of value based living – identification of comprehensive human goal – humanistic education – universal human order – competence and issues in professional ethics.		
Self Study Topics		
Human psychology – for realizing the full human potential		
Total Hours		45
Learning Resources:		
Text Books:		
1	Srinivasan D, Sirajunnisa A , “Universal Human Values”,Pearson India Education Services Pvt.Ltd, Noida, 1 st Edition 2023.	
2	Gaur R R, Asthana R, Bagaria G P, “A Foundation Course in Human Values and Professional Ethics”, Excel Books, New Delhi, 2 nd Revised Edition 2012.	
Reference Books:		
1	Jeevan Vidya: E.K. Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.	
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.	
3	Mohandas Karamchand Gandhi ,”The Story of My Experiments with Truth”, 2009.	

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
GEA1102	ENGINEERING PHYSICS	II	BS	2	1	0	3	3
Pre-requisite	Nil	Course Type	Theory	QP TYPE				QP1
Course Objectives:								
This course enables the students to impart the fundamentals of fibre optics, quantum mechanics, properties of matter, thermal physics, semiconductor physics, modern engineering materials, and their engineering applications.								
Course Outcomes:								
Upon completion of the course, the students will be able to								
CO	Course Outcomes:							
CO1	Analyze the light propagation in an optical fiber							
CO2	Apply the dual nature of matter concept to the real-world problems							
CO3	Examine the material behavior of beams in terms of modulus of elasticity							
CO4	Investigate the need for semiconducting materials for the specific real-time applications							
CO5	Design and fabricate the materials based on their properties and need.							
SYLLABUS								
Module I	FIBRE OPTICS AND ITS APPLICATIONS							9
Introduction – Fundamentals of fibre optics – critical angle – total internal reflection – propagation of light through optical fibres – Fractional index change – Numerical aperture – Types of fibre. Losses in fibre: absorption losses, scattering losses, bending losses and dispersion losses – Fibre optic communication system –temperature and displacement sensor – Broadband communication (Qualitative).								
Guided Self Study Topics								
Fabrication of Fibre – fibre optic transmission link								
Module II	QUANTUM PHYSICS AND ITS APPLICATIONS							9
Introduction –Wave – particle duality – de Broglie hypothesis of Matter waves – wave function –Schrödinger wave equation– physical significance of wave function. Application of Schrödinger wave equation – particle in 1D box - Photoelectric effect - experimental study - fundamental laws of photoelectric emission – Einstein's photoelectric								

equation.		
Guided Self Study Topics		
Heisenberg's uncertainty Principle – Energy Eigen value for a free particle		
Module III	PROPERTIES OF MATTER AND THERMAL PHYSICS	9
Introduction – stress – strain diagram of ductile material – Poisson's ratio – Hooke's law – Modulus of elasticity– relation between elastic constants – Bending of beams.		
Expression for the Young's modulus of a cantilever – expressions for the Young's modulus of beam by uniform bending and non-uniform bending. Introduction to thermal Physics – Modes of heat transfer – Thermal conductivity and emissivity.		
Guided Self Study Topics		
Module IV	SEMICONDUCTOR AND ITS APPLICATIONS	9
Introduction – Basics of the band theory of solids - Types of semiconductors – Hall effect – determination of Hall coefficient.		
P-N junction diode – voltage – current characteristics of a P-N junction diode – Introduction to optoelectronic devices – LED - construction, working and applications of LED – Solar Cell – construction, working and applications of solar cell.		
Guided Self Study Topics		
Energy bands in Solids		
Module V	MODERN ENGINEERING MATERIALS AND ITS APPLICATIONS	9
Introduction – Shape memory alloys – characteristic, properties and applications of SMA – Carbon nanotubes: fabrication –pulsed laser deposition – chemical vapor deposition - properties and applications.		
Introduction to composites – Matrix – reinforcement – Classification of composites – Fabrication of polymer composites–properties and uses.		
Guided Self Study Topics		
Nano materials – properties – applications – metal-metal matrix composites – metal – ceramic composites		
Total Hours		45
Learning Resources:		
Text Books:		
1	Shatendra Sharma, Jyotsna Sharma, Engineering Physics, First Edition, Pearson India Education services Pvt., Ltd, India, 2018	
2	Pandey K and Chaturvedi S, Engineering Physics, Second Edition, Cengage	

	Learning India Pvt., Ltd, Delhi, 2022
3	Kakani S L and Shubhra Kakani, Applied Physics Theory and Practical, Viva Book Pvt., Ltd, New Delhi, 2015
4	Bhattacharya D K, Poonam T, Engineering Physics, Oxford University Press, New Delhi, 2017
Reference Books:	
1	Fedor Mitschke, Fibre Optics Physics and Technology, Second Edition, Springer, Germany, 2016
2	Murugesan R, Properties of Matter, S. Chand Publishing, New Delhi, 2017
3	Malik H K and Singh A K, Engineering Physics, Second Edition, McGraw Hill Education (India) Pvt., Ltd, Chennai, 2023.
4	Jasprit Singh, Semiconductor Devices: Basic Principles, Wiley, New Delhi, 2012

Course Code	Course Title	Sem	Category	Periods / Week				C
				L	T	P	S	
ADI1111	PYTHON PROGRAMMING FOR DATA SCIENCE	II	PC	2	1	0	1	3
Pre-requisite	Python Programming Hand book Practices	Course Type	Theory	QP TYPE				QP2
Course Objectives:								
Students will gain a practical implementation of various python concepts, enabling them to manipulate and analyse data efficiently. Various Python libraries for data pre-processing, enhancing their data manipulation and cleaning skills will enhance their data science capabilities.								
Course Outcomes:								
Upon completion of the course, the students will be able to:								
CO Number	Course Outcomes							Max BTL
CO1	Explicate the fundamental concepts in which the algorithmic thinking and problem solving would be employed.							BTL3
CO2	Manipulate and populate the data using appropriate python packages by learning and implementing the data structure concepts.							BTL4
CO3	Evaluate the effectiveness of visualization paradigms to have deeper insights on problem statement.							BTL4
CO4	Implement the data preprocessing techniques to achieve greater data driven decision making.							BTL4
CO5	Apply statistical approaches to uncover the hidden patterns and structure of the data.							BTL3
Syllabus								
Module I	Python Fundamentals						BTL3	10
Introduction to python – Variables – Data types – Operators Control flow statements – Looping – Functions and modules – File handling.								
Guided Self Study Topics								
- sales management system - task management application								

• user authentication			
Module II	Regular Exceptions and Python Packages	BTL4	9
Regular expressions: function in RegEx, Meta characters, Errors and Exception: handling exception- NumPy: Multidimensional arrays Array manipulation and computation- Pandas: Data structures (Series & Data Frame) – Data cleaning and manipulation.			
Guided Self Study Topics			
• Text processing • Web scraping • Scientific computing			
Module III	Data Visualization	BTL4	9
Introduction to Data visualization – Matplotlib for basic plotting – Seaborn – statistical data visualization Advanced plotting techniques – subplots – customizing plots.			
Guided Self Study Topics			
• Financial Data Analysis • Exploratory Data Analysis • Branding and Presentation			
Module IV	Data Wrangling	BTL4	8
Data pre-processing techniques: missing data handling- data normalization, Data aggression Grouping – Merging and joining datasets – handling categorical data.			
Guided Self Study Topics			
• Customer Relationship Management (CRM) • Sales Analysis			
Module V	Exploratory Data Analysis	BTL3	9
Statistical analysis with Python – mean, median, mode – Correlation Analysis Exploratory data analysis -Types of Exploratory data analysis – Data visualization for EDA.			
Guided Self Study Topics			
• Employee Salary Analysis • Marketing Campaign Analysis • Quality Control			

		Total Hours	45
Learning Resources:			
Text Books:			
1	A.A.Punthambekar "Python Programming for Data Science, First Edition, Technical Publication, 2024"		
2	Anurag Gupta, G.P BISWAS ,” Python Programming – Problem solving, packages and Libraries, Edition 1, Tata McGraw Hill, 2018		
3	E Balagurusamy, “Problem Solving and Python Programming”, Edition1, Tata McGraw Hill, 2018		
Reference Books:			
1	Allen B. Downey, “Think Python: How to Think Like a Computer Scientist, 2 nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.		
2	John V Guttag, —Introduction to Computation and Programming Using Python, Revised and expanded Edition, MIT Press , 2013		
3	John V. Guttag, Introduction to Computation and Programming using PythonII, Prentice Hall of India, 2014.		
4	Reema Thareja, “Python Programming using Problem Solving Approach”, OXFORD University Press, 2017.		

Course Code	Course Title	Sem	Category	Periods / Week				C	
				L	T	P	S		
ADI1131	PYTHON PROGRAMMING FOR DATA SCIENCE	II	PC	3	0	0	3	3	
Pre-requisite	C Programming	Course Type	Theory	QP Type				QP2	
Course Objectives:									
Students will gain programming knowledge using various Python concepts, enabling them to manipulate and analyze the data efficiently in real-time applications. The various Python libraries for data pre-processing, manipulation, and visualization will enhance their data analytic skills.									
Course Outcomes:									
Upon completion of the course, the students will be able to:									
CO Number	Course Outcomes							MAX BTL	
CO1	Apply the fundamental concepts of Python programming, which aid in algorithmic thinking and problem solving.							3	
CO2	Manipulate the data using appropriate Python packages by implementing the learned data structure and file concepts.							4	
CO3	Analyze the effectiveness of data visualization paradigms to gain deeper insights into problem statements.							4	
CO4	Implement the data preprocessing techniques to achieve greater data-driven decision-making.							4	
CO5	Apply statistical measures to uncover the hidden patterns in the data and ensure ethical practices using the data science lifecycle.							4	
Syllabus									
Module I	PYTHON FUNDAMENTALS							10	3
Introduction to Python – Python Interpreter Modes - Variables – Data types – Operators – Control Flow Statements – Looping – Functions.									
Guided Self Study Topics									
- Student Management System. - User Authentication.									

Module II	FILES, EXCEPTIONS AND PYTHON PACKAGES	9	4
File Handling – File Operations – File Accessing Modes - Errors and Exceptions – Handling Exceptions – Modules – Numpy : Array Manipulations – Multidimensional Array with its built-in functions – Pandas: Data structures (Series & Data Frame).			
Guided Self Study Topics			
- Files and Directory Management System. - Scientific Computing.			
Module III	DATA VISUALIZATION	9	4
Introduction to Data visualization – Matplotlib for Basic Plotting – Seaborn – Statistical Data Visualization – Advanced Plotting Techniques – Subplots – Customizing Plots.			
Guided Self Study Topics			
- Financial Data Analysis. - Student Mark Analysis.			
Module IV	DATA WRANGLING	8	4
Data Pre-Processing Techniques: Missing Data Handling- Data Normalization, Data Aggregation and Grouping – Merging and Joining Datasets – Handling Categorical Data.			
Guided Self Study Topics			
- Detecting and Handling Outliers. - Customer Behaviour Analysis. - Sales Analysis.			
Module V	EXPLORATORY DATA ANALYSIS	9	4
Statistical Analysis using Python – Central Tendency Measures : Mean, Median, Mode - Standard Deviation – Correlation Analysis – Introduction to EDA - Data Exploration Techniques - Types of Exploratory Data Analysis – Data Visualization for EDA.			
Guided Self Study Topics			
- Online Fraud detection. - Marketing Campaign Analysis.			
Total Hours			45
Learning Resources:			
Text Books:			
1.	A.A.Punthambekar "Python Programming for Data Science, First Edition, Technical Publication, 2024".		

2.	Anurag Gupta, G.P BISWAS ,” Python Programming – Problem Solving, Packages and Libraries, Edition 1, Tata McGraw Hill, 2018.
3.	E Balagurusamy, “Problem Solving and Python Programming”, Edition 1, TataMcGraw Hill, 2018.
4.	Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.
Reference Books:	
1.	Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2 nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.
2.	John V Guttag, —”Introduction to Computation and Programming Using Python”, Revised and expanded Edition, MIT Press , 2013.
3.	John V. Guttag,”Introduction to Computation and Programming using Python”,, Prentice Hall of India, 2014.
4.	Reema Thareja, “Python Programming using Problem Solving Approach”, OXFORD University Press, 2017.

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
ADI1152	PYTHON PROGRAMMING FOR DATA SCIENCE	II	PC	3	0	0	3	3
Pre-requisite	Python Programming Hand book Practices	Course Type	Theory	QP TYPE				QP2
Course Objectives:								
Students will gain a practical implementation of various python concepts, enabling them to manipulate and analyse data efficiently. Various Python libraries for data pre-processing, enhancing their data manipulation and cleaning skills will enhance their data science capabilities.								
Course Outcomes:								
Upon completion of the course, the students will be able to:								
CO Number	Course Outcomes							
CO1	Explicate the fundamental concepts in which the algorithmic thinking and problem solving would be employed.							
CO2	Manipulate and populate the data using appropriate python packages by learning and implementing the data structure concepts.							
CO3	Evaluate the effectiveness of visualization paradigms to have deeper insights on problem statement.							
CO4	Implement the data preprocessing techniques to achieve greater data driven decision making.							
CO5	Apply statistical approaches to uncover the hidden patterns and structure of the data.							
Syllabus								
Module I	Python Fundamentals							10
Introduction to python – Variables – Data types – Operators Control flow statements – Looping – Functions and modules – File handling.								
Guided Self Study Topics								
- Sales management system - Task management application - User authentication								
Module II	Regular Exceptions and Python Packages							9
Regular expressions: function in RegEx, Meta characters, Errors and Exception: handling								

exception- NumPy: Multidimensional arrays Array manipulation and computation- Pandas: Data structures (Series & Data Frame) – Data cleaning and manipulation.		
Guided Self Study Topics		
• Text processing • Web scraping • Scientific computing		
Module III	Data Visualization	9
Introduction to Data visualization – Matplotlib for basic plotting – Seaborn – statistical data visualization Advanced plotting techniques – subplots – customizing plots.		
Guided Self Study Topics		
• Financial Data Analysis • Exploratory Data Analysis • Branding and Presentation		
Module IV	Data Wrangling	8
Data pre-processing techniques: missing data handling- data normalization, Data aggression Grouping – Merging and joining datasets – handling categorical data.		
Guided Self Study Topics		
• Customer Relationship • Management (CRM) Sales Analysis		
Module V	Exploratory Data Analysis	9
Statistical analysis with Python – mean, median, mode – Correlation Analysis Exploratory data analysis -Types of Exploratory data analysis – Data visualization for EDA.		
Guided Self Study Topics		
• Employee Salary Analysis • Marketing Campaign Analysis • Quality Control		
Total Hours		45
Learning Resources:		
Text Books:		
1	A.A. Punthambekar "Python Programming for Data Science, First Edition, Technical Publication, 2024"	
2	Anurag Gupta, G.P BISWAS ,” Python Programming – Problem solving, packages	

	and Libraries, Edition 1, Tata McGraw Hill, 2018
3	E Balagurusamy, "Problem Solving and Python Programming", Edition1, Tata McGraw Hill, 2018
Reference Books:	
1	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist,,,,, 2 nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2	John V Guttag, —Introduction to Computation and Programming Using Python,,,,, Revised and expanded Edition, MIT Press , 2013
3	John V. Guttag, Introduction to Computation and Programming using Pythonll, Prentice Hall of India, 2014.
4	Reema Thareja, "Python Programming using Problem Solving Approach", OXFORD University Press, 2017.

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
GEA1121	ENGINEERING MATHEMATICS II	II	BS	2	1	2	3	4
Pre-requisite	Matrices, Differential and Integral Calculus	Course Type	TCPL	QP TYPE				QP1
Course Objectives:								
This course will provide the knowledge of various concepts of numerical analysis and statistics to solve real life problems.								
Course Outcomes:								
Upon completion of the course, the students will be able to:								
CO	Course Outcomes:							
CO1	Analyze the techniques of testing of hypotheses to draw conclusions in statistics with specific sample size							
CO2	Examine the design of experiments in the various real time engineering problems by ANOVA method							
CO3	Solve the equations by numerical methods with engineering applications							
CO4	Apply the numerical techniques of interpolation and integration to obtain approximate solutions of mathematical problems							
CO5	Solve the ordinary differential equations using numerical methods in engineering problems							
SYLLABUS								
Module I	TESTING OF HYPOTHESIS							9
Sampling distributions - Tests for single mean, Difference of means (large samples) Tests for single mean, Difference of means (Small samples) - Chi-square test for goodness of fit – Independence of attributes.								
Guided Self Study Topics								
Tests for Proportion								
Module II	DESIGN OF EXPERIMENTS							9
One way and Two way classification : Completely Randomized Design – Randomized Block Design Latin Square Design								
Guided Self Study Topics								
2 ² – factorial design								

Module III	NUMERICAL SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS	9
Newton-Raphson method – Gauss-Jordan methods Iterative method: Gauss-Seidel - Eigenvalues of a matrix by Power method.		
Guided Self Study Topics		
Regula-Falsi method		
Module IV	INTERPOLATION AND NUMERICAL INTEGRATION	9
Newton's divided difference interpolation – Newton's forward and backward difference interpolation, Numerical integration using Trapezoidal rule and Simpson's 1/Third & 3/8th rules.		
Guided Self Study Topics		
Double integrals using numerical techniques		
Module V	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	9
Euler's method - Modified Euler's method - Fourth order Runge- Kutta method for solving first order equations. Milne's predictor-corrector method for solving first order equations.		
Guided Self Study Topics		
Finite difference method		
TOTAL HOURS		45
List of Experiments / Exercises:		30
Testing Statistical Hypothesis using R:		
1	Tests for single, difference of Means	
2	Applications: Chi – Square test for Goodness of fit	
3	Applications: Two way ANOVA	
4	Applications: Latin Square Design	
Numerical Solutions of Equations using R:		
5	Solving system of Linear Equations : Gauss-Seidel	
6	Power method to approximate dominant eigenvalue and eigenvector	
7	Newton's forward and Backward Interpolation	
8	Numerical integration using Trapezoidal rule and Simpson's 1/Third rule	
9	Euler's modified method	
10	Runge-Kutta method	
Total Hours		75

Learning Resources:**Text Books:**

1	Grewal, B.S., "Numerical methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2	Johnson, R.A. and Gupta, C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th edition, 2020.

Reference Books:

1	Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9 th edition, 2010.
2	Spiegel, M.R., Schiller, J. and Srinivasan, R.A., "Schaum's Outlines Probability and Statistics", Tata McGraw Hill Fourth edition, 2012.
3	Garreel Grolemond, "Hands-on Programming with R", First Edition, O'Reilly, 2014.

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
CGB1122	DATA STRUCTURES	II	PC	2	0	4	2	4
Pre-requisite	C Programming	Course Type	TCPR	QP TYPE				QP1
Course Objectives: Equip students with a deep understanding of fundamental data structures—including arrays, linked lists, stacks, queues, trees, and graphs—and their applications, enabling them to analyze and implement various operations such as list manipulations, tree traversals, and graph representations to effectively solve real-world problems through efficient data organization and manipulation techniques.								
Course Outcomes: Upon completion of the course, the students will be able to:								
CO	Course Outcomes:							
CO1	Implement various list operations using array and linked list							
CO2	Demonstrate Stack and Queue with suitable applications							
CO3	Analyze the tree traversing algorithms for Binary Tree, Binary Search Tree and AVL Tree							
CO4	Demonstrate the representation and traversal techniques of graphs in various applications							
CO5	Build an algorithmic approach for solving real-time problems							
SYLLABUS								
Module I	LINEAR DATA STRUCTURE – LIST							6+9
Definition of data structure-classification of data structures - data structure operations - List: Introduction, Representation using array and linked list, Operations of Linked Lists . Types: Singly Linked List, Doubly Linked List - Applications of Linked List: Polynomial manipulation.								
Guided Self Study Topics								
Circular Linked List								
Case Study Problems								
a. Implement List ADT to store the elements 10, 20, 30, 40, 50 and find any element and delete 30 from the list and display the elements after deletion. Use Array for list Implementation. b. Write a C program to implement the operations of List ADT using linked list and								

perform the following. - Create a Linked list with the elements 11, 22, 44, 55 - Insert 33 after 22 - Delete the element 22 from the list c. Display the elements.		
Module II	LINEAR DATA STRUCTURE - STACK, QUEUE	6+9
Stack: Definition, Array representation of stack, Linked representation of stack - Applications of Stack: Evaluation of a Postfix Expression, Infix Expressions into Postfix Expressions. Queue: Definition, Array representation of Queue, Linked representation of Queue - Applications of Queue in Real world.		
Guided Self Study Topics		
Circular Queue		
Case Study Problems		
- Write a C Program to implement LIFO structure. Use array Implementation. - Write a C program to implement FIFO structure. Use array Implementation.		
Module III	NON-LINEAR DATA STRUCTURE-TREES	6+9
Introduction and Definition of Trees - Tree Terminology - Binary Tree: Representing Binary Trees in Memory - Traversing Binary Tree: Pre-order, In-order, post-order traversal. Evaluation of expression tree. Binary Search trees: Searching and Inserting in Binary Search trees - Deleting in a Binary search tree - AVL trees - Priority Queue (Heaps) – Binary Heap.		
Guided Self Study Topics		
Applications of trees		
Case Study Problems		
- Write a C Program to create a binary tree and obtain the order of the nodes by applying various tree traversal methods - Write a C program to implement a self-balancing tree with a nodal height difference of 1 unit.		
Module IV	Non-Linear Data Structure – Graphs	6+9
Introduction - Graph terminology - Directed Graphs - Sequential representation of graphs. Adjacent matrix, Path matrix - Linked representations of a Graph - Traversing a graph:		
Guided Self Study Topics		
Applications of graphs		

Case Study Problems		
a. A person wants to visit some places. He starts from a vertex and then wants to visit every vertex till it finishes from one vertex, backtracks, and then explores another vertex from the same vertex. What traversal methodology suits best for him and implement it using C? b. Construct a minimum spanning tree for a graph using Prim's or Kruskal's Algorithm.		
Module V	PROJECT SPECIMEN	15
1. Student Management System 2. Phone Directory Application using doubly linked list. 3. Stack based Text Editor 4. Map Navigator (Dijkstra's Algorithm)		
Total Hours		45
Learning Resources:		
Text Books:		
1	Reema Thareja, "Data Structures Using C, Second Edition, Oxford University Press, 2020	
2	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C, 2 nd Edition, Pearson Education, 2020	
Reference Books:		
1	Hemant Jain, "Problem Solving in Data Structures & Algorithms Using C", First edition, 2016	
2	Yashavant Kanetkar, "Data Structures Through C - 4 th Edition: Learn the fundamentals of Data Structures through C", BPB Publications; 4th edition, 2022.	
3	E Balagurusamy, "Data Structures Using C", McGraw Hill Education, First Edition, 2017.	
4	Ellis Horowitz, Sartaj Sahni, Susan Anderson - Freed, "Fundamentals of Data Structures in C", Universities Press, Second edition, 2008	

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
ADI1112	PYTHON PROGRAMMING FOR DATA SCIENCE LABORATORY	II	PC	0	0	2	0	1
Pre-requisite	Python Programming Hand book Practices	Course Type	Practical	QP TYPE				ASPR
Course Objectives: To provide students with hands-on experience in applying Python programming to real-world data science tasks. By the end of this course, students will have a solid foundation in Python and will be proficient in using its libraries and tools for data manipulation, analysis, and visualization.								
Course Outcomes: Upon completion of the course, the students will be able to:								
CO Number	Course Outcomes							
CO1	Apply Python features for problem design and implementation							
CO2	Explore various python packages for the manipulation of various data structures							
CO3	Implement descriptive analytics on the data ingested from various python data structures							
CO4	Apply various data preprocessing techniques for smoother data transformation							
CO5	Explore various data visualization packages and perform data exploratory analysis to identify hidden features							
Syllabus								
List of Experiments / Exercises:								30
1	Create a program that reads three integers from the user and displays them in sorted order (from smallest to largest). Use the min and max functions to find the smallest and largest values. The middle value can be found by computing the sum of all three values, and then subtracting the minimum value and the maximum value.							

2	create a program that reads a letter of the alphabet from the user. If the user enters a, e, i, o, or u then your program should display a message indicating that the entered letter is a vowel. If the user enters y then your program should display a message indicating that sometimes y is a vowel, and sometimes y is a consonant. Otherwise, your program should display a message indicating that the letter is a consonant.
3	Write a function that generates a random password. The password should have a random length of between 7 and 10 characters. Each character should be randomly selected from positions 33 to 126 in the ASCII table. Your function will not take any parameters. It will return the randomly generated password as its only result. Display the randomly generated password in your file's main program. Your main program should only run when your solution has not been imported into another file
4	Write a program to read a CSV file containing student information (name, age, and grade) using Pandas. Perform the following tasks: • Display the first five rows of the data frame. • Calculate the average age of the students. • Filter out the students who have a grade above a certain threshold.
5	Write a program to create a NumPy array with random numbers and convert it into a Pandas Data Frame with appropriate column names. Perform operations such as calculating the mean, median, and standard deviation of the data using both NumPy and Pandas functions.
6	Write a program to create a NumPy array with random numbers and convert it into a Pandas Data Frame with appropriate column names. Perform operations such as calculating the mean, median, and standard deviation of the data using both NumPy and Pandas functions.
7	Write a program to create a scatter plot using Matplotlib to visualize the relationship between two variables in a dataset. Add a trendline to the scatter plot using linear regression
8	Write a program to create a heatmap using Seaborn to visualize the correlation matrix of a dataset. Customize the colour palette and add annotations to the heatmap.
9	Write a program to create a figure with multiple subplots using Matplotlib. Plot multiple line plots on different subplots to visualize the trends of different variables. Add legends and customize the appearance of the subplots.
10	Write a program to handle missing data in a dataset using Pandas. Implement techniques such as dropping missing values, filling missing values with mean or median, and forward/backward filling.

11	Write a program to perform feature hashing on a categorical variable using Pandas or Scikit-learn. Convert categorical variables into a numerical format by applying a hash function.	
12	Write a program to merge two datasets based on a common column using Pandas. Perform an inner join, left join, and right join between the datasets.	
13	Write a program to create a box plot using Matplotlib or Seaborn to visualize the distribution of a numerical variable across different categories. Add appropriate labels and titles to the plot.	
14	Write a program to create a bar chart or stacked bar chart using Matplotlib or Seaborn to compare the frequency distributions of a categorical variable across different groups or categories in a dataset.	
15	Write a program to perform correlation analysis between two numerical variables in a dataset using NumPy or Pandas. Calculate the correlation coefficient and visualize the correlation using a scatter plot	
Total Hours		30
Learning Resources:		
Text Books:		
1	A.A. Punthambekar "Python Programming for Data Science, First Edition, Technical Publication, 2024"	
2	Anurag Gupta, G.P BISWAS ,” Python Programming – Problem solving, packages and Libraries, Edition 1, Tata McGraw Hill, 2018	
3	E Balagurusamy, “Problem Solving and Python Programming”, Edition1, Tata McGraw Hill, 2018	
Reference Books:		
1	Allen B. Downey, “Think Python: How to Think Like a Computer Scientist,,,,, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.	
2	John V Guttag, —Introduction to Computation and Programming Using Python,,,,, Revised and expanded Edition, MIT Press , 2013	
3	John V. Guttag, Introduction to Computation and Programming using Pythonll, Prentice Hall of India, 2014.	
4	Reema Thareja, “Python Programming using Problem Solving Approach”, OXFORD University Press, 2017.	

Course Code	Course Title	Sem	Category	Periods/week				C
				L	T	P	S	
GEA1111	ENGINEERING PHYSICS LABORATORY	II	BS	0	0	2	0	1
Pre-requisite	Nil	Course Type	Practical	QP TYPE				ASPR
Course Objectives								
This course will enable learners to impart the usage of basic apparatus and to study the characteristics of the materials and light source.								
Course Outcomes								
Upon completion of the course, the students will be able to:								
CO1	Analyze the properties of an optical fibre and the wavelength of a laser source							
CO2	Determine a Planck's constant and analyze the variation in photocurrent.							
CO3	Analyze the thermal behaviour of poor conductors							
CO4	Examine the elastic behaviour of a given material.							
CO5	Investigate the properties of semiconducting material.							
CO6	Determine the properties of a liquid under ultrasonic conditions and simulate the indentation behaviour of a material.							
Syllabus								
List of Experiments / Exercises:								30
1	Examine the numerical aperture and acceptance angle values of a given optical fibre							
2	Determine the wavelength of the given laser source							
3	Determine the size of the Lycopodium powder using laser							
4	Design the necessary circuit to find the Planck's Constant							
5	Investigate the variation of photocurrent with the intensity of light							
6	Test the thermal conducting nature of a given poor conductor using Lee's disc method							
7	Inspect the given thin wire by finding its rigidity modulus value.							
8	Estimate the Young's modulus of the given material by using non-uniform bending method							
9	Examine the bandgap value of a given semiconducting material							

10	Analyse the type of a given semiconductor material based on its Hall coefficient and charge density values	
11	Determine the velocity of Ultrasonic waves and compressibility of the given liquid by formation of acoustical grating - Ultrasonic interferometer	
12	Determine the indentation hardness of the material using Vicker’s hardness method	
Total Hours		30
Learning Resources:		
Text Books:		
1	Palanisamy P.K. ,”Physics laboratory manual”, Scitech Publications Pvt Ltd, Chennai, 2002	
2	Senthilkumar G, “Physics laboratory manual”, VRB Publishers Pvt Ltd, Chennai, 2014	
Reference Books:		
1	Jayaraman R. , Umadevi V, Maruthamuthu S, Saravanakumar B, “Engineering Physics laboratory manual”, Pearson Education India, 2013	
2	Rao CVM, “Engineering Physics lab manual”, Scitech Publications (India) Pvt Ltd, 2010	
3	Zarena D, “Engineering Physics - Laboratory Manual”, Nitya Publications, Bhopal, 2023	
4	Kakani S.L., ”Engineering Practical Physics”, CBS Publisher & Distributors P Ltd, 2011	

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
ADI1132	PYTHON PROGRAMMING FOR DATA SCIENCE LABORATORY	II	PC	0	0	2	0	1
Pre-requisite	Hand Book	Course Type	Practical	QP Type				ASPR
Course Objectives:								
To provide students with hands-on experience in applying Python programming to real-world problems in data science. Students will have a solid foundation in Python and will be proficient in using its libraries and tools for data manipulation, analysis and visualization.								
Course Outcomes:								
Upon completion of the course, the students will be able to:								
CO Number	Course Outcomes							
CO1	Apply salient Python features for problem design and implementation.							
CO2	Explore various python packages for the manipulation of various data structures.							
CO3	Implement descriptive analytics on the data ingested from various data python structures.							
CO4	Apply various data preprocessing techniques for smoother data transformation.							
CO5	Explore various data visualization packages and perform data exploratory analysis to identify hidden features.							
Syllabus								
List of Experiments / Exercises:								30
1	Write a program that reads three integers from the user and displays them in sorted order (from smallest to largest). Use the min and max functions to find the smallest and largest values. The middle value can be found by computing the sum of all three values and then subtracting the minimum value and the maximum value.							

2	Write a program that reads a letter of the alphabet from the user. If the user enters a, e, i, o, or u then the program should display a message indicating that the entered letter is a vowel. If the user enters y then the program should display a message indicating that sometimes y is a vowel and sometimes y is a consonant. Otherwise, the program should display a message indicating that the letter is a consonant.
3	Write a function that generates a random password. The password should have a random length of between 7 and 10 characters. Each character should be randomly selected from positions 33 to 126 in the ASCII table. The function will not take any parameters. It will return the randomly generated password as its only result. Display the randomly generated password in the file's main program. The main program should only run when the solution has not been imported into another file
4	Write a program to read a CSV file containing student information (name, age and grade) using Pandas. Perform the following tasks: • Display the first five rows of the data frame. • Calculate the average age of the students. • Filter out the students who have a grade above a certain threshold.
5	Write a program to create a NumPy array with random numbers and convert it into a Pandas Data Frame with appropriate column names. Perform operations such as calculating the mean, median, and standard deviation of the data using both NumPy and Pandas functions.
6	Write a program to create a NumPy array with random numbers and convert it into a Pandas Data Frame with appropriate column names. Perform operations such as calculating the mean, median and standard deviation of the data using both NumPy and Pandas functions.
7	Write a program to create a scatter plot using Matplotlib to visualize the relationship between two variables in a dataset. Add a trendline to the scatter plot using linear regression.
8	Write a program to create a heatmap using Seaborn to visualize the correlation matrix of a dataset. Customize the colour palette and add annotations to the heatmap.
9	Write a program to create a figure with multiple subplots using Matplotlib. Plot multiple line plots on different subplots to visualize the trends of different variables. Add legends and customize the appearance of the subplots.
10	Write a program to handle missing data in a dataset using Pandas. Implement techniques such as dropping missing values, filling missing values with mean or median and forward/backward filling.

11	Write a python program to handle categorical data by checking whether the given dataset has bogus values or not.	
12	Write a program to merge two datasets based on a common column using Pandas. Perform an inner join, left join and right join between the datasets.	
13	Write a program to create a box plot using Matplotlib or Seaborn to visualize the distribution of a numerical variable across different categories. Add appropriate labels and titles to the plot.	
14	Write a program to create a bar chart or stacked bar chart using Matplotlib or Seaborn to compare the frequency distributions of a categorical variable across different groups or categories in a dataset.	
15	Write a program to perform correlation analysis between two numerical variables in a dataset using NumPy or Pandas. Calculate the correlation coefficient and visualize the correlation using a scatter plot.	
Total Hours		30
Learning Resources:		
Text Books:		
1	A.A.Punthambekar "Python Programming for Data Science, First Edition, Technical Publication, 2024".	
2	Anurag Gupta, G.P BISWAS ,” Python Programming – Problem Solving, Packages and Libraries, Edition 1, Tata McGraw Hill, 2018.	
3	E Balagurusamy, “Problem Solving and Python Programming”, Edition1, TataMcGraw Hill, 2018.	
Reference Books:		
1	Allen B. Downey, “Think Python: How to Think Like a Computer Scientist,,,,, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.	
2	John V Guttag, —Introduction to Computation and Programming Using Python,,,,, Revised and expanded Edition, MIT Press, 2013.	
3	John V. Guttag, Introduction to Computation and Programming using Pythonll, Prentice Hall of India, 2014.	
4	Reema Thareja, “Python Programming using Problem Solving Approach”, OXFORD University Press, 2017.	

Course Code	Course Title	Sem	Category	Periods/Week					C
				L	T	P	S	C	
ADI1153	PYTHON PROGRAMMING FOR DATA SCIENCE LABORATORY	II	PC	0	0	2	0	1	BTL4
Pre-requisite	Hand Book	Course Type	Practical	QP TYPE					ASPR
Course Objectives:									
To provide students with hands-on experience in applying Python programming to real-world problems in data science. Students will have a solid foundation in Python and will be proficient in using its libraries and tools for data manipulation, analysis and visualization.									
Course Outcomes:									
Upon completion of the course, the students will be able to:									
CO Number	Course Outcomes								
CO1	Apply salient Python features for problem design and implementation.								
CO2	Explore various python packages for the manipulation of various data structures.								
CO3	Implement descriptive analytics on the data ingested from various data python structures.								
CO4	Apply various data preprocessing techniques for smoother data transformation.								
CO5	Explore various data visualization packages and perform data exploratory analysis to identify hidden features.								
Syllabus									
List of Experiments / Exercises:									30
1	Write a program that reads three integers from the user and displays them in sorted order (from smallest to largest). Use the min and max functions to find the smallest and largest values. The middle value can be found by computing the sum of all three values and then subtracting the minimum value and the maximum value.								
2	Write a program that reads a letter of the alphabet from the user. If the user enters a, e, i, o, or u then the program should display a message indicating that the entered letter is a vowel. If the user enters y then the program should display a message indicating that sometimes y is a vowel and sometimes y is a consonant.								

	Otherwise, the program should display a message indicating that the letter is a consonant.
3	Write a function that generates a random password. The password should have a random length of between 7 and 10 characters. Each character should be randomly selected from positions 33 to 126 in the ASCII table. The function will not take any parameters. It will return the randomly generated password as its only result. Display the randomly generated password in the file's main program. The main program should only run when the solution has not been imported into another file
4	Write a program to read a CSV file containing student information (name, age and grade) using Pandas. Perform the following tasks: • Display the first five rows of the data frame. • Calculate the average age of the students. • Filter out the students who have a grade above a certain threshold.
5	Write a program to create a NumPy array with random numbers and convert it into a Pandas Data Frame with appropriate column names. Perform operations such as calculating the mean, median, and standard deviation of the data using both NumPy and Pandas functions.

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
GEA1123	CAREER SKILL DEVELOPMENT I	II	HS	1	0	0	1	1
Pre-requisite	Nil	Course Type	Theory	QP TYPE				QP1
Course Objectives:								
This course facilitates the student to acquire sharpened analytical skill and to improve thinking capability of the students, and improve the basic skills in communication and to develop the conversation and Team management skills.								
Course Outcomes:								
Upon completion of the course, the students will be able to:								
CO	Course Outcomes:							
CO 1	Quickly solve simple problems using speed math techniques.							
CO 2	Effectively communicate in verbal and written form without grammatical errors.							
CO 3	Effectively communicate in public forum, build a team and lead it.							
SYLLABUS								
Module I	QUANTITATIVE APTITUDE AND REASONING							7
Divisibility - HCF & LCM - Simplification - Averages - Ratio and Proportion - Number Series & Letter Series - Coding & Decoding - Logical Puzzle.								
Module II	VERBAL ABILITY							3
Speaking: Introducing Oneself and Others - Sentence Connection & Connectors - Parts of Speech - Idioms and Phrasal Verbs.								
Module III	SOFT SKILLS							15
Leadership Skills - Extempore Speech - JAM - Add It Up - Developing story from its context - Team Building.								
Total Hours								25
Learning Resources:								
Reference Books:								
1	Aggarwal R.S, "Quantitative Aptitude", S. Chand & Company Limited, 2022.							
2	Aggarwal R.S, "A Modern Approach to Verbal & Non - Verbal Reasoning", S. Chand & Company Limited, 2022.							

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
GEA1122	Tamils and Technology	II	HS	1	0	0	1	1
Pre-requisite	Heritage of Tamils	Course Type	Theory	QP TYPE				QP1
Course Objectives:								
This course will enable learners to promote and protect tamils skills of weaving, building technology, manufacturing industry, agricultural industry, irrigation techniques and scientific technologies in Tamil development.								
Course Outcomes:								
Upon completion of the course, the students will be able to:								
CO	Course Outcomes:							
CO 1	Describe about weaving and building technology.							
CO 2	Remember the development of the manufacturing industry and agricultural technology.							
CO 3	Describe the irrigation techniques and development of scientific Tamil.							
SYLLABUS								
Module I	WEAVING AND CERAMIC TECHNOLOGY							5
Weaving Industry during Sangam Age- Designs and Constructions in Sangam Age - Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram. Great Temples of Cholas and other worship places- Temples of Nayaka Period – Type study (Madurai Meenakshi Temple)- ThirumalaiNayakarMahal – Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.								
Module II	MANUFACTURING INDUSTRY AND AGRICULTURAL TECHNOLOGY							5
Metallurgical studies – Iron industry – Irons melting, steel -Copper and gold Coins as source of history – Minting of Coins. Beads making-industries Stone beads– Types of Beads inSilappathikaram, Agriculture and agro-related activities.								
Module III	IRRIGATION TECHNOLOGY AND SCIENTIFIC TAMIL							5
Dam, lake, ponds, sluice -Significance of KumizhiThoompu of Chola Period - Knowledge of Sea – Fisheries – Pearl – Conches diving.								

Development of Scientific Tamil –Digitalization of Tamil Books – Development of Tamil Software – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.	
Total Hours	15
Learning Resources:	
Text Books:	
1	Tamils and technology - – Dr.D. Devahi, Dr.S.K.Azhakambigai , Dr. D. Alagudurai, VRB Publishers Private Limited, Chennai.
Reference Books:	
1	Thamizhaga Varalaru - MakkalPanpadum, K.K. Pillai (Published By : Tamil Nadu Textbook And Educational Works Corporation) 19 th Edition – June – 2023
2	Keezhadi – Vaigai Nadhikkariyil Sangakaala Nagara Naagarikam - Archaeology Department Publication)
3	Porunai Atrangarai Naagarigam(Archaeology Department Publication)

Course Code	Course Title	Sem	Category	Periods/Week				C
				L	T	P	S	
GEA1122	தமிழரும் தொழில்நுட்பமும் (Tamils and Technology)	II	HS	1	0	0	1	1
Pre-requisite	தமிழர் மரபு (Heritage Of Tamils)	Course Type	Theory	QP TYPE				QP 1
Course Objectives:								
தொழிநுட்ப நூல்களைப் பற்றி புரிந்துகொள்ளுதல் , கற்பவர்களின் தொழில்முறை திறன்களை வளர்த்தல், கட்டிடங்களின் வடிவங்களை உருவாக்குவதற்கான பொறியியலை மேம்படுத்துதல், நீர்ப்பாசனம் மற்றும் வேளாண்மைத் தொழில்நுட்பத்தினைப் பயிற்றுவித்தல், தமிழை வளர்க்கும் மற்றும் பாதுகாக்கும் தொழில் நுட்பத்தினை செயல்படுத்துதல்.								
Course Outcomes:								
Upon completion of the course, the students will be able to:								
CO Number	Course Outcomes							
CO1	நெசவு மற்றும் கட்டிடத் தொழில்நுட்பம் பற்றி அறிந்திருப்பர்.							
CO2	உற்பத்தித் தொழில் மற்றும் வேளாண்மைத் தொழில் நுட்ப வளர்ச்சியினை புரிந்திருப்பர்							
CO3	நீர்ப்பாசன தொழில் நுட்பம் மற்றும் அறிவியல் தமிழ் வளர்ச்சியினைப் பாதுகாக்கும் முறையினைப் பயின்றிருப்பர்							
Syllabus								
Module I	நெசவு மற்றும் கட்டிடத் தொழில்நுட்பம்							5
சங்ககால நெசவுத் தொழில் - சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் - சிலப்பதிகாரத்தில் மேடையமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்கள், கோவில்கள் - சோழர் காலத்துப் பெருங்கோவில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர்கால கோவில்கள் - மதுரை மீனாட்சியம்மன் கோவில் - திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை.								
Module II	உற்பத்தித் தொழில் மற்றும் வேளாண்மைத் தொழில் நுட்பம்							5

உலோகவியல் - இரும்புத்தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள், வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள்		
Module III	நீர்ப்பாசன தொழில்நுட்பம் மற்றும் அறிவியல் தமிழ்	5
அணை, ஏரி, குளங்கள், மதகு - சோழர் கால குமுழித் தூம்பின் முக்கியத்துவம் - கடல் சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக் குளித்தல் - அறிவியல் தமிழின் வளர்ச்சி - தமிழ் நூல்களை மின் பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்குதல் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.		
Total Hours		15
Learning Resources:		
Text Books:		
1	தமிழரும் தொழில்நுட்பமும் – முனைவர். த.தேவகி, முனைவர் ச.க.அழகாம்பிகை, முனைவர் த . அழகுதுரை, வி.ஆர்.பி பப்ளிஷர்ஸ் பிரைவேட் லிமிடெட், சென்னை	
Reference Books:		
1	தமிழக வரலாறு – மக்கள் பண்பாடும் கே.கே. பிள்ளை(வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம் , பத்தொன்பதாம் பதிப்பு - ஜூன் 2023	
2	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)	
3	பொருறை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)	