

KR21

B.Tech I Year Course Structure (KR21 Regulations)
COMPUTER SCIENCE AND ENGINEERING

I YEAR I SEMESTER						
S.No.	Course Code	Course Title	L	T	P	C
1	EN101HS	Communicative English	2	0	0	2
2	PP102ES	Programming for Problem Solving	3	0	0	3
3	EP103BS	Engineering Physics	2	1	0	3
4	MA104BS	Advanced Calculus and Transforms	3	0	0	3
5	BE105ES	Basic Electrical and Electronics Engineering	3	1	0	4
6	PP106ES	Programming for Problem Solving Lab	0	0	3	1.5
7	EN107HS	English Language Communication Skills lab	0	0	2	1
8	EP108BS	Engineering Physics Lab	0	0	3	1.5
9	EE109ES	Basic Electrical and Electronics Engineering Lab	0	0	2	1
Total			13	2	10	20

I YEAR II SEMESTER						
S. No.	Course Code	Course Title	L	T	P	C
1	MA201BS	Linear Algebra and Differential Equations	3	0	0	3
2	CH202BS	Chemistry	3	0	0	3
3	EG203ES	Engineering Graphics	1	0	4	3
4	PP204ES	Python Programming	2	0	0	2
5	EW205ES	Engineering Workshop	1	0	3	2.5
6	CH206BS	Chemistry Lab	0	0	3	1.5
7	PP207ES	Python Programming Lab	0	0	2	1
8	MA208BS	Linear Algebra and Calculus - Lab Using Python	0	0	4	2
9	*MC209ES	Environmental Science	3	0	0	0
*Mandatory Course			Total	13	0	16
*Mandatory Course			Total	13	0	18



B.Tech I Year Sem II (KR21 Regulations)

COMPUTER SCIENCE AND ENGINEERING

MA201BS– LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

B.Tech. I Year II Sem Syllabus

L	T	P	C
3	0	0	3

Course Objectives: To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
- Concept of Ordinary Differential equations
- Concept of Growth and Decay models.
- Evaluation of Laplace Transforms
- Evaluation of Ordinary differential equations using Laplace Transforms

Course Outcomes: After learning the contents of this paper the student must be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigen values and Eigen vectors of a matrix and apply it to reduce the quadratic form to canonical form using orthogonal transformations.
- Solve differential equations of first order
- Solve the applications on the first order differential equations.
- Apply Laplace Transforms to ordinary differential equations.

UNIT-I: Matrices

Real, Complex matrices and their properties, Rank of a matrix by reducing to Echelon form and Normal form, Inverse of a non-singular matrices by Gauss Jordan method. Consistency of system of linear equations using method of ranks. LU Decomposition method.

UNIT-II: Eigen values, Eigen vectors and Quadratic Forms

Eigen values and Eigen vectors of a matrix, Properties of Eigen values and Eigen vectors of real and complex matrices (without proof), Finding linearly independent Eigen vectors when Eigen values are repeated and non-repeated. Principal Component Analysis (PCA),

Cayley-Hamilton theorem (statement and verification), Inverse and powers of a matrix using Cayley-Hamilton theorem, Diagonalization of a matrix, Singular Value Decomposition (SVD), Gram Schmidt orthogonalization, Quadratic forms up to three variables: rank, index, signature and nature of quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation.

UNIT-III: Differential equations of first order

Exact equations and equations reducible to exact form using integrating factors, Linear and Non-linear (Bernoulli's) equations. Applications: Newton's law of cooling, Law of natural growth and decay. LR circuit.

UNIT-IV: Higher Order ODE

Linear differential equations of second and higher order with constant coefficients, solution of non-homogeneous linear differential equations with constant coefficients of the form $f(D)y = Q(x)$ where $Q(x) = e^{ax}$, $\sin(ax + b)$ or $\cos(ax + b)$, x^n , $e^{ax}V(x)$, $x^nV(x)$. Equations reducible to linear differential equations with constant coefficients: Cauchy's homogeneous linear equation, Legendre's linear equation, Method of variation of parameters. Applications: LCR circuit and Simple Harmonic Motion.

UNIT-V: Laplace Transforms

Laplace Transforms; Laplace Transform of standard functions; first shifting theorem; Laplace transforms of functions when they are multiplied and divided by 't'. Laplace transforms of derivatives and integrals of function; Evaluation of integrals by Laplace transforms; Laplace transforms of Special functions; Laplace transform of periodic functions. Inverse Laplace transform by different methods, convolution theorem (without Proof), solving ODEs by Laplace Transform method.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Paras Ram, Engineering Mathematics, 2nd edition, CBS Publishes

REFERENCES:

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Srimanta pal and Subodh C.Bhunia, Engineering Mathematics.
4. Charu C. Aggarwal, Linear Algebra and Optimization for Machine Learning A Textbook, Springer Publications.



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B.Tech I Year SEM II Course Structure (KR21 Regulations)

COMPUTER SCIENCE AND ENGINEERING

CH202BS – CHEMISTRY

B.Tech. I Year II Sem Syllabus

L	T	P	C
3	0	0	3

Course Objectives:

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
- To comprehend the advanced level with Parameters of drug discovery.
- To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.

Course Outcomes:

The basic concepts included in this course will help the student to gain:

- The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
- Able to understand the problem of water and its treatments.
- The required principles and concepts of electrochemistry, corrosion. Apply knowledge in Drug design and discovery.
- The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.

Unit - I: Molecular structure and Theories of Bonding: Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules. Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral, Octahedral and square planar geometries

Unit - II: Water and its treatment: Introduction – hardness of water – Causes of hardness – Types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonisation. Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.

Unit - III: Electrochemistry and corrosion: Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, and glass electrode. Nernst equation Determination of pH of a solution by using glass electrode. Electrochemical series and its applications. Batteries – Primary (Lithium cell) and secondary batteries (Lithium ion battery). Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods.

Unit - IV: Protein structure, Synthesis of drug molecules, Drug Design and Discovery : Protein structure, Structure based protein classification, Protein structure databases and tools, protein structure alignment. Areas influencing Drug Discovery, Parameters of drug discovery, Discovery technologies and strategies, Target identification & validation. Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Unit - V: Spectroscopic techniques and applications: Principles of spectroscopy, selection rules and applications of electronic spectroscopy. IR spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, multiplicity, chemical shift. Introduction to Magnetic resonance imaging.

Suggested Text Books:

1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry by P.C.Jain&M.Jain; DhanpatRai Publishing Company (P) Ltd., New Delhi.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
4. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E.Schore, 5th Edition. 5. University Chemistry, by B.M. Mahan, Pearson IV Edition.
6. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S.Krishnan
7. Prof. SVS Rana ,Biotechniques (Theory & Practice) (BC-43), Rastogi Publications
8. SC Rastogi, N.Mendiratta, P.Rastogi, Bioinformatics: Methods and Application: Genomics, Proteomics and Drug Discovery, PHI Publications, 2013



B.Tech I Year SEM II Course Structure (KR21 Regulations)

COMPUTER SCIENCE AND ENGINEERING

EG203ES – ENGINEERING GRAPHICS

B.Tech. I Year II Sem Syllabus

L	T	P	C
1	0	4	3

Course Objectives:

- To apply drafting techniques using AutoCAD
- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

Course Outcomes: At the end of the course, the student will be able to:

- Apply AutoCAD for engineering drawings
- Draw scales, engineering curves like conic sections and cycloids
- Construct orthographic projections of points, lines and planes
- Estimate lateral surface of the sheet metal required for making simple solids.
- Draw orthographic projections of solids and sectional views of simple solids.

UNIT - I: Overview of Computer Graphics: Demonstrating knowledge of the theory of CAD software, setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning, snap to objects manually and automatically. **Commands:** Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command.

UNIT-II: Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); **Cycloid**, Epicycloid, Hypocycloid.

Scales: Reduced and Enlarged scales, representative fraction, Plain, Diagonal.

UNIT-III: Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.

UNIT-IV: Projections of Regular Solids – Prism, Cylinder, Pyramid, Cone.

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Isometric Projection Solids- Prism, Cylinder, Pyramid, Cone.

UNIT-V: Sections and Sectional Views of Right Regular Solids: Prism, Cylinder, Pyramid, Cone – Auxiliary Views; **Development of surfaces of Right Regular Solids** - Prism, Pyramid, Cylinder and Cone. CAD modelling software's, STL format.

Suggested Reading:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. S.N. Lal., Engineering Drawing (2018), M/S. Cengage Learning India Pvt. Ltd., PratapGanj, Delhi
6. CAD/CAM- Michael P Groover, TMH



B.Tech I Year SEM II Course Structure (KR21 Regulations)

COMPUTER SCIENCE AND ENGINEERING

PP204ES– PYTHON PROGRAMMING

B.Tech. I Year II Sem Syllabus

L	T	P	C
2	0	0	2

Course Objectives:

- The student will be able to learn problem solving skills using ‘PYTHON’ programming language, which is a pre-requisite to learn many other programming Languages.
- The purpose of this course is to provide the basic programming methodology in Python.
- This course will enable the students to learn programming skills necessary to implement all the basic mathematical, scientific, and real-world applications.
- Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language.
- This course will give the foundation for a beginner to develop computer programs effectively.

Course Outcomes: Upon graduation:

- Student will be able Identify the various building blocks to write a Python program.
- Use control statements for solving a given problem.
- Implement fundamental data structures for manipulating data.
- Build user defined functions to improve code reusability.
- Use File concepts to store and retrieve data from disk.

UNIT 1:

Basics of Python Jupiter (tool): Introduction, Setting working directory, creating and saving a script file, File execution, comments, variables.

Numbers: Introduction, Data types, Operators, Built-in functions, related modules.

Conditional Statements and Loops: if statement, switch statement, while loop, for loop.

Functions: Namespace, Scope and Local Functions, Returning Multiple Values, Functions as Objects, Anonymous (Lambda) Function.

UNIT 2:

Data Structures and Sequences:

Strings: Array as string, regular expression, concatenation, modification, searching and sorting

List: Creating a List, adding and removing elements, slicing, concatenation and sorting

Tuple : Creating, adding and removing , methods

Dictionary : Creating, adding and removal , Hashing and key types

Set : Union, Disjunction, Conjunction and set operations

UNIT 3:

Files, I/O and File Handling

Reading a CSV file, JSON file and other file formats

File I/O, Opening and Closing a file, Reading and writing a file, Deleting a file, File methods, file and directory related commands, File and OS interface commands, Handling Errors

UNIT 4:

Numpy: The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions, Aggregations: Min, Max, and other functions, Comparisons, Masks, and Boolean Logic, Fancy Indexing, Sorting Arrays, Structured Data: NumPy's Structured Arrays.

Pandas: Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical indexing, Combining Dataset - Concat and Append, Merge and Join, Aggregation and Grouping

UNIT 5:

Data Visualization with matplotlib: Simple Line Plots, Simple Scatter Plots, Pie chart, Box Plot, Matplotlib Grid, Display images, Tables, Date handling, Log and Polar plot. Visualizing Errors, Density and Contour Plots, Histograms, Binnings and Density, Customizing Plot Legends, Customizing Colorbars, Multiple Subplots, Text and Annotation, Customizing Ticks, Customizing Matplotlib: Configurations and Stylesheets

TEXT BOOKS :

1. Data Science Handbook , Jake VanderPlas, O'REILLY Publication, 2016
2. Python for Data Analysis, Wes McKinney, O'Reilly Publication, 2012

REFERENCES:

1. Allen B. Downey , “ Think Python: How to Think Like a Computer Scientist”, Second Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Shroff “Learning Python: Powerful Object-Oriented Programming; Fifth edition, 2013.
3. David M.Baezly “Python Essential Reference”. Addison-Wesley Professional; Fourth edition, 2009.
4. David M. Baezly “Python Cookbook” O'Reilly Media; Third edition (June 1, 2013)



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B.Tech I Year SEM II Course Structure (KR21 Regulations) COMPUTER SCIENCE AND ENGINEERING

EW205ES– ENGINEERING WORKSHOP

B.Tech. I Year II Sem Syllabus

L	T	P	C
1	0	3	2.5

Pre-requisites: Practical skill

Course Objectives:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

Course Outcomes: At the end of the course, the student will be able to:

- Study and practice on machine tools and their operations
- Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, house wiring, welding and Tin-smithy.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiselling.
- Apply basic electrical engineering knowledge for house wiring practice.
- Study and practice on 3D printing with Auto-Cad and CNC Machines

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

I. Carpentry

II. Fitting

III. Welding Practice

IV. Electrical wiring – (Parallel & Series, Two-way Switch and Tube Light)

V. Tin-smithy

VI. 3D printing: To make use of additive manufacturing for the development of objects using Auto-CAD.

VII. CNC Machine: To make use of CNC machine for machining of mechanical components.

2.TRADES FOR DEMONSTRATION & EXPOSURE:

- I. Plumbing,
- II. Machining (*Lathe Machine, Drilling Machine & Grinding Machine*)
- III. Power tools in construction and Wood Working (Power Hack saw, Wood Turning Lathe)

3.PRESENTATION & VIDEO LECTURES

- I. 3D printing
- II. CNC Machine

TEXT BOOKS:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.
3. Additive Manufacturing Technologies, Rapid Prototyping to direct digital manufacturing - Springer 2010 / Lan Gibson, David W Rosen & Brent Stucker.
4. CAD/CAM- Michael P Groover, TMH

REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP
3. HajraChoudary, "Elements of Workshop Technology" Vol. 1, Asian Publishers, Edn., 1993.
4. G.S. Sawhney, "Mechanical Experiments and Workshop Practice", I.K. International Publishing House, New Delhi, 2009.



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B.Tech I Year SEM II Course Structure (KR21 Regulations)

COMPUTER SCIENCE AND ENGINEERING CH206BS – CHEMISTRY LAB

B.Tech. I Year II Sem Syllabus

L	T	P	C
0	0	3	1.5

Course Objectives:

The course consists of experiments related to the principles of chemistry required for engineering student.

The student will learn:

- Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
- The measurement of physical properties like surface tension and viscosity.
- To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic techniques.
- To estimate the strength of very low concentration with accuracy of metals by colorimetry.

Course Outcomes:

The experiments will make the student gain skills on:

- Determination of parameters like hardness and chloride content in water.
- Determination of physical properties like surface tension and viscosity.
- Calculation of Rf values of some organic molecules by TLC technique.
- Estimation of strength of very low concentration with accuracy of metals by colorimetry.

List of Experiments:

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Synthesis of Aspirin and Paracetamol
6. Determination of acid value of coconut oil
7. Determination of viscosity of a given liquid by using Ostwald's viscometer.
8. Determination of surface tension of a given liquid using stalagmometer.
9. Thin layer chromatography calculation of Rf values. egortho and para nitro phenols
10. Colorimetric estimation of strength of Cu.

References

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
3. Vogel's text book of practical organic chemistry 5th edition
4. Text book on Experiments and calculations in engineering chemistry – S.S. Dara



B.Tech I Year SEM II Course Structure (KR21 Regulations)

COMPUTER SCIENCE AND ENGINEERING

PP207ES– PYTHON PROGRAMMING LAB

B.Tech. I Year II Sem Syllabus

L	T	P	C
0	0	2	1

Course Objectives: To learn

- Understand the usage of data types, loops and conditional statements and functions.
- Understand Lists, Dictionaries and Regular expressions in Python.
- Handle Strings and Files in Python.
- Learn the implementation of Python modules like NumPy, Pandas, matplotlib.

Course Outcomes: After learning the contents of this course the student is able to

- Examine Python syntax and semantics and be fluent in the use of Python flow control and functions. Demonstrate proficiency in handling Strings and File Systems.
- Create, run and manipulate Python Programs using core data structures like Lists, Tuples, and Dictionaries.
- Implement exemplary applications related to NumPy, Pandas and matplotlib in Python.

List of Programs

1. a) Arun is working in an office which is **N** blocks away from his house. He wants to minimize the time it takes him to go from his house to the office. He can either take the office cab or he can walk to the office. Arun's velocity is **V1 m/s** when he is walking. The cab moves with velocity **V2 m/s** but whenever he calls for the cab, it always starts from the office, covers **N** blocks, collects Arun and goes back to the office.

The cab crosses a total distance of **N** meters when going from office to Arun's house and vice versa, whereas Arun covers a distance of $(\sqrt{2})(2)*N$ while walking. Write a program to help Arun to find whether he should walk or take a cab to minimize the time.

- b) There is a robot which wants to go the charging point to charge itself. The robot moves in a 2-D plane from the original point (0,0). The robot can move toward UP, DOWN, LEFT and RIGHT with given steps. The trace of robot movement is shown as the following: UP 5 DOWN 3 LEFT 3 RIGHT 2 Then, the output of the program should be: 2 The numbers after the direction are steps. Write a program to compute the distance between the current position after a sequence of movement and original point. If the distance is a float, then just print the nearest integer (use round() function for that and then convert it into an integer).

2. a) Write a program that prints the numbers from 1 to 100. But for multiples of three print “**Fizz**” instead of the number and for the multiples of five print “**Buzz**”. For numbers which are multiples of both three and five print.
- b) Write a program to check whether a given positive number is a Harshad Number or not. A Harshad number is an integer that is divisible by the sum of its digits. For example, 171 is a Harshad Number because the sum of digits is $9(1+7+1)$ and 171 is divisible by 9.
- c) Given a number n , write an efficient function to print all unique prime factors of n . For example, if the input number is 315, then output should be "3 5 7".
- d) A semiprime number is an integer which can be expressed as a product of two distinct primes. For example, $15 = 3*5$ is a semiprime number but $9 = 3*3$ is not. Given an integer number N , find whether it can be expressed as a sum of two semi-primes or not (not necessarily distinct).
3. a) You are given a string which is a password, write a program to check if the password entered by the user is a valid or not. If it is a valid password then print “valid” else print “Invalid”
 Rules of the password:
- i) Minimum length is 6 characters and maximum length is 15 characters.
 - ii) It should have a minimum of one Capital Letter, One digit and one special symbol
 - iii) Special symbols allowed are only (*, @, #)
- b) Given a string S having characters from English alphabets ['a' - 'z'] and '.' as the special character (without quotes). Write a program to construct the lexicographically smallest palindrome by filling each of the faded character ('.') with a lower-case alphabet.
 The smallest lexicographical order is an order relation where string s is smaller than t , given the first character of s (s_1) is smaller than the first character of t (t_1), or in case they are equivalent, the second character, etc.
- c) Given an alphanumeric string S , write a program to extract maximum numeric value from that string. All the alphabets are in lower case. Take the maximum consecutive digits as a single number.
4. a) Given a list A of elements of length N , ranging from 0 to $N-1$. All elements may not be present in the array. If the element is not present then there will be -1 present in the array. Rearrange the array such that $A[i] = i$ and if i is not present then insert -1 at that place.
- b) Given an array A of N numbers, you have to write a program which prints the sum of the elements of array A with the corresponding elements of the reverse of array A . If array A has elements [1,2,3], then reverse of the array A will be [3,2,1] and the resultant array should be [4,4,4].
- c) Given a list A of N distinct integers, write a program to sort the list by moving an element to the end of the list. Find the minimum number of moves required to sort the list using this method in ascending order.
5. a) A lower triangular matrix is a square matrix (where the number of rows and columns are equal) where all the elements above the diagonal are zero. Write a program to convert a given square matrix into a lower triangular matrix.

- b) Given a square matrix, write a program to print it in a counter-clockwise spiral form.
6. a) Given a number n, define a function named printDict() which can print a dictionary where the keys are numbers between 1 and n (both included) and the values are square of keys. The function printDict() doesn't take any argument.
- b) Write a program to find the most common scores in the list of scores given in sorted order based on occurrence from largest to smallest. If any of scores are having same occurrence then consider the largest score first.
- Input format: First line contains the list of scores and next line contains a number (k) which represent the top most scores to display.
- Output format: display the k top most scores.
7. a) Write a program that loads roll numbers and names from the given CSV file into dictionary where data is organized as one row per record. It takes a roll number or name as input and prints the corresponding other value from dictionary.
- b) Write a program to find the frequency of distinct words in the given text file and store the words along with the frequency in a CSV file.
8. Import the iris dataset from <https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data>
- Find the mean, median, standard deviation of iris's 'sepal length' (1st column).
 - Filter the rows of iris_2d that has petallength (3rd column) > 1.5 and sepallength (1st column) < 5.0
9. Import the Cars93 dataset into a data frame from https://raw.githubusercontent.com/selva86/datasets/master/Cars93_miss.csv
- Check if dataframe has any missing values.
 - Count the number of missing values in each column of dataframe. Which column has the maximum number of missing values?
 - Replace missing values in Min.Price and Max.Price columns with their respective mean.
10. a) A number raised to the third power is a *cube*. Plot the first five cubic numbers, and then plot the first 5000 cubic numbers.
- b) Colored Cubes: Apply a colormap to your cubes plot.
11. Sitka is in a temperate rainforest, so it gets a fair amount of rainfall. In the data file *sitka_weather_2018_simple.csv* is a header called PRCP, which represents daily rainfall amounts. Make a visualization focusing on the data in this column.

TEXT BOOKS :

1. Data Science Handbook , Jake VanderPlas, O'REILLY Publication, 2016
2. Python for Data Analysis, Wes McKinney, O'Reilly Publication, 2012

REFERENCES:

1. Allen B. Downey , “ Think Python: How to Think Like a Computer Scientist”, Second Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Shroff “Learning Python: Powerful Object-Oriented Programming; Fifth edition, 2013.
3. David M.Baezly “Python Essential Reference”. Addison-Wesley Professional; Fourth edition, 2009.
4. David M. Baezly “Python Cookbook” O'Reilly Media; Third edition (June 1, 2013)



B.Tech I Year Sem II (KR21 Regulations)
COMPUTER SCIENCE AND ENGINEERING

MA208BS– LINEAR ALGEBRA AND CALCULUS LAB USING PYTHON

B.Tech. I Year II Sem Syllabus

L	T	P	C
0	0	4	2

Co-Requisite: Programming for problem solving using Python

Course Objective:

- To explain Basic operations, Trace, Determinant and Inverse of a matrix.
- To find Eigen values, Eigen vectors, Diagonalize square matrix and to verify Cayley Hamilton theorem
- To explain the relevant methods to solve First and Higher order Ordinary Differential Equations.
- To execute various problems in Calculus.

Course Outcome: Upon completing this course, students will be able to

- Apply various Algebraic operations on matrices using python program.
- Determine Eigen values and Eigen vectors of a matrix.
- Explore all possible solutions of First and Higher order Ordinary Differential Equations.
- Apply python program to determine Partial Derivative, Double Integral, Triple Integral and Vector Integrals.
- Construct Fourier series of a given function.

List of Programs:

1. Programs on different types of matrices
2. Programs on algebraic operations on 2D arrays/ matrices
3. Programs on finding trace, determinant and inverse of a matrix
4. Programs on rank and solutions of linear system of equations.
5. Programs on finding eigen values and eigen vectors
6. Programs on verification and application of Cayley Hamilton theorem
7. Programs on diagonalization of a matrix, SVD
8. Programs on graphical representation of solution of ordinary differential equations of first order

9. Programs on graphical representation of solution of ordinary differential equations of higher order
10. Programs on partial derivative of a given function
11. Programs on Jacobian of the given functions
12. Programs on Taylor's series for functions of two variables
13. Programs on double integral in Cartesian coordinates
14. Programs on triple integrals in Cartesian coordinates
15. Programs on gradient, divergence and curl for given function
16. Programs on directional derivative of a given function at a point in the direction of the vector
17. Programs on angle between the two surfaces at given point
18. Programs on volume integral
19. Programs on Fourier series of a given function

Note: Any 15 experiments should be completed.

Text Books/Suggested Reading/Online Resources:

1. Basics of Linear Algebra for Machine Learning-Jason Brownlee
2. J.C. Bautista, Mathematics and Python Programming Paperback, Lulu.com (13 September 2014).
3. <https://numpy.org/doc/stable/user/quickstart.html#linear-algebra>
4. <https://python-tricks.com/matplotlib-in-numpy/>
5. <https://www.math.ubc.ca/~pwalls/math-python/linear-algebra/linear-algebra-scipy/#characteristic-polynomials-and-cayley-hamilton-theorem>
6. <https://apmonitor.com/pdc/index.php/Main/SolveDifferentialEquations>
7. <https://www.geeksforgeeks.org/python-sympy-matrix-diagonalize-method/>
8. <https://www.auraauto.com/uncategorized/demonstration-of-fourier-series-using-python-code/>
9. <https://stackoverflow.com/questions/30791504/python-partial-derivatives-easy>



B.Tech I Year SEM II Course Structure (KR21 Regulations)

COMPUTER SCIENCE AND ENGINEERING *MC209ES– ENVIRONMENTAL SCIENCE

B.Tech. I Year II Sem Syllabus

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Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes:

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT-I: Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II: Natural Resources: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT-III : Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV: Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT-V: Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

- Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
- Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

- Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
- Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
- Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.