First Year in B. Tech. (Computer Engineering) Syllabus
Aligned with New Education Policy 2020
With effective from 2023 - 2024

(University Department only)

Department of Computer Engineering

Dr. Babasaheb Ambedkar Technological University, Lonere - 402103

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First Year in B. Tech. in Computer Engineering
Course Curriculum Aligned with New Education Policy 2020
(with effective from Academic Year 2023 - 2024)
First Semester

Course Code	Type of Course	Course Name	Weekly Hours		Examination Scheme			Credit
			L	P	CA	MSE	ESE	
COEMD111	BSC	Environmental Science and Engineering	2	2	20	20	60	3
COEMD112		Set Theory and Logic	3	-	20	20	60	3
COEES113	ESC	Engineering Mathematics - I	4	-	20	20	60	4
COEES114		Engineering Chemistry	3	-	20	20	60	3
COEES115		Digital Electronics	3	-	20	20	60	3
COESE116	VSEC	C Programming	1	2	60	-	40	2
COEAE114L	ESC	Engineering Chemistry Lab	-	2	60	-	40	1
COEAE117L	ESC	Digital Electronics Lab	-	2	60	-	40	1
COECC118	CC	A. NSS B. NCC C. Yoga Education	1	2	60	-	40	2
		Total	17	10	340	100	460	22

Course Type and Acronyms used

1. Basic Science Course (BSC)
2. Engineering Science Course (ESC)
3. Program Core Course (PCC)
4. Vocational Skill Enhancement Course (VSEC)
5. Co-curricular Course (CC)
6. Ability Enhancement Course (AEC)
7. Indian Knowledge System (IKS)

L - Lecture,

P / PR - Practical,

CA - Continuous Assessment, TH - Theory,

MSE - Mid Semester Examination,

ESE - End Semester Examination,

CR - Credit

First Year in B. Tech. in Computer Engineering
Course Curriculum Aligned with New Education Policy 2020
(with effective from Academic Year 2023 - 2024)
<u>**Second Semester**</u>

Course Code	Type of Course	Course Name	Weekly Hours		Examination Scheme			Credit
			L	P	CA	MSE	ESE	
COEMD121	BSC	Statistics and Probability	3	-	20	20	60	3
COEMD122	AEC	Communication Skills	2	-	20	20	60	2
COEES123	ESC	Engineering Mathematics- II	4	-	20	20	60	4
COEES124	ESC	Engineering Physics	3	-	20	20	60	3
COEMJ125	PCC	OOP in C++	3	-	20	20	60	3
COESE126	VSEC	Web Site Development and MS Office	1	2	60	-	40	2
COEES124L	ESC	Engineering Physics Lab	-	2	60	-	40	1
COEMD122L	BSC	Data Science with Python	-	2	60	-	40	1
COEMJ125L	PCC	OOP Lab	-	2	60	-	40	1
COECC127	CC	Communication Skills Lab	-	2	60	-	40	1
COEIK1228	IKS	Hindustani Music	-	2	60	-	40	1
		Total	**16**	**12**	**460**	**100**	**540**	**22**
Exit Requirements to award Certificate in Computer Engineering (any two courses from following courses)								
COESE1X1	VSEC	Mobile Application Development for iOS Devices	1	6	60	40	-	4
COESE1X2	VSEC	Mobile Application Development for Android Devices	1	6	60	40	-	4
COESE1X3	VSEC	Drone Technology	1	6	60	40	-	4
COESE1X4	CC	Enterpreneurship	1	6	60	40		4

<u>**Course Type and Acronyms used**</u>

1. Basic Science Course (BSC)   L - Lecture, TH - Theory,
2. Engineering Science Course (ESC)   P / PR - Practical,
3. Program Core Course (PCC)   CA - Continuous Assessment,
4. Vocational Skill Enhancement Course (VSEC)   MSE - Mid Semester Examination,
5. Co-curricular Course (CC)   ESE - End Semester Examination,
6. Ability Enhancement Course (AEC)   CR - Credit.
8. Indian Knowledge System (IKS)

Recommended NPTEL/SWAYAM Courses

NPTEL (National Programme on Technology Enhanced Learning), and SWAYAM (Study Webs of Active-Learning for Young Aspiring Minds) are online learning platforms promoted by the government of India. The mapping courses are included in the university syllabus with NPTEL/SWAYAM courses. Students and teachers can adopt these NPTEL/SWAYAM courses for self-study and reference.

University Course	NPTEL/SWAYAM Course
Semester I	
Environmental Sciences and Engineering	Environment Science Course by Prof. Sudha Goel, Shamik Choudhary
Set Theory and Logic	Discrete Mathematics by Benny George and Sajith Gopalan IIT Kharagpur
Digital Electronics	Digital Electronics by prof Gautam Saha IIT Kharagpur
C Programming	Introduction to C Programming by Satyadev Nadkumar IIT Kanpur
Indian Yoga System	Yoga and Positive Psychology for Managing Career and Life by Ashish Pandey IIT Bombay
Semester II	
Statistics and Probability	Probability and Statistic by Somesh Kumar IIT Kanpur
Data Science with Python	Python for Data Science byRaghunathan Rengasamy
OOP in C++	Programming in C++ Partha Pratim Das IIT Kanpur
Web Site Development and MS Office	Introduction to Modern Application Development by Gaurav Raina and Tanmai Gopal IIT MAdaras
Entrepreneurship (Startup Course)	Zero to One Notes on startup
Hindustani Music	Appreciating Hidusthani Music Course by Prof. Laxmi Sriram and Srijan Deshpande IIT Madras
Communication Skills	Communication Skills by T Ravichandran IIT Kanpur

Teaching Scheme		Semester I Environmental Science and Engineering	Examination Scheme	
TH	2	**Course Objectives:**	CA	20
PR	2	1. To create awareness of environmental catastrophes and climate change.	MSE	20
CR	3	2. Identify and analyze the different segments that constitute the environment and their interrelationships.	ESE	60
		3. Recognize the value of biodiversity in maintaining ecosystem resilience and providing ecosystem services.		
		4. Identify sources and causes of soil, water, air pollution and their effects on quality and agricultural productivity.		
		5. Evaluate various approaches to solid waste management, including recycling, composting, and waste reduction.		

COURSE CONTENT

Unit No.	Topic	Hours
1	**Environment:** Introduction, Components of Environment, Types of Environment, Brief discussion on Segments of Environment, Environmental Pollution, Ecosystem-Types of Ecosystem, Components of Ecosystem.	03 Hrs
2	**Air Pollution:** Introduction, Brief discussion on air pollutants, Sources of Air Pollution- Pollutants from Industry, Pollution by Automobiles; Effect of Air Pollutions-Acid rain, Green House Effect, Global warming; Brief discussion on Control of Air Pollution.	04 Hrs
3	**Water Pollution:** Introduction, Types of Water Pollutants, Sources of Water Pollution, Methods to remove impurities in water, Treatment of Waste water, Impact of Water Pollution on Human Health, Water as a carrier for the transmission of diseases.	03 Hrs
4	**Soil and Noise Pollution:** Sources of Soil Pollution, Harmful Effects of Soil Pollution, Control of Soil Pollution, Noise Pollution- Sources, Effects and Control Measures of Noise Pollution.	03 Hrs
5	**Solid Waste Management:** Classification of Solid Waste- Sources and Types of Solid Waste, Causes of Solid Waste Management- Disposal of Solid Waste, Recycling of Solid Waste Awareness of Environment, Role of Individuals in Pollution Prevention.	03 Hrs

Text Books:

1. Environmental Science, V. K. Ahluwalia and Sunita Malhotra.
2. Environmental Chemistry (Sixth Edition), A. K. De.

3. Essential Environmental Studies, S. P. Mishra and S. N. Pandey.

Teaching Scheme		Semester I Set Theory and Logic	Examination Scheme	
TH	3	**Course Objectives:**	CA	20
PR	-	1. Analyse the logical structure of statements symbolically, including the proper use of logical connectives, predicates, and quantifiers.	MSE	20
CR	3	2. Construct truth tables, prove or disprove a hypothesis, and evaluate the truth of a statement using the principles of logic. 3. Properly use higher mathematics vocabulary and symbolic notation in definitions, theorems, and problems. 4. Solve problems and write proofs using the concepts of set theory, including the methods of Venn diagrams and truth tables.	ESE	60

COURSE CONTENT

Unit No.	Topic	Hours
1	**Introduction to Propositional Logic:** Propositions, truth values, Truth tables for operators, Truth Tables of Compound Propositions, Precedence of Logical Operators. **Propositional Equivalences:** Logical Equivalences, Constructing New Logical Equivalences. **Propositional Calculus:** Normal Forms, Predicates.	08 Hrs
2	**Predicates and Quantifiers:** Predicates, Quantifiers: Universal and Existential, Quantifiers with Restricted Domains, Precedence of Quantifiers, Binding Variables, Logical Equivalences Involving Quantifiers, Negating Quantified Expressions, Translating from English into Logical Expressions, Examples from Lewis Carroll, Nested Quantifiers: Understanding Statements Involving Nested Quantifiers, The Order of Quantifiers, Negating Nested Quantifiers.	07 Hrs
3	**Rules of Inference:** Valid Arguments in Propositional Logic, Rules of Inference for Propositional Logic, Using Rules of Inference to Build Arguments, Resolution, Fallacies.	06 Hrs
4	**Basic notions in set Theory:** Sets, Venn Diagrams, Subsets, The Size of a Set, Power Sets, Cartesian Products, Set operations, Set Identities, Generalized Unions and Intersections, Cardinality of Sets.	05 Hrs
5	Mathematical Induction, Basic Counting Principles, The Pigeonhole Principle.	05 Hrs

Text Books:
1. C. L. Liu, Elements of Discrete Mathematics, McGraw-Hill Publication, 3rd Edition, 2008.

2. Kenneth H. Rosen, Discrete Mathematics and its Applications, McGraw-Hill Publication, 6th Edition, 2010.
3. Y. N. Singh, Discrete Mathematical Structures, Wiley Publication, 1st Edition, 2010.
4. Dr. Sukhendu Dey, Graph Theory with Applications, SPD Publication, 1st Edition, 2012.

Teaching Scheme		Semester I Engineering Mathematics - I	Examination Scheme	
TH	4	**Course Objectives:**	CA	20
PR	-	1. To know the application of Linear algebra to find solutions to a system of linear equations arising in engineering problems.	MSE	20
CR	4	2. To know and apply the concept of partial derivatives and their applications to Maxima/Minima, series expansion of multi-valued functions.	ESE	60
		3. To understand the Computation of Jacobian functions of several variables and their applications to engineering problems		
		4. To identify and sketch curves in various coordinate systems.		
		5. To evaluate multiple integrals and their applications to area and volume.		

COURSE CONTENT

Unit No.	Topic	Hours
1	**Linear Algebra- Matrices:** The inverse of a matrix by Gauss-Jordan method; Rank of a matrix; Normal form of a matrix; Consistency of non-homogeneous and homogeneous systems of linear equations; Eigenvalues and eigenvectors; Properties of eigen values and eigen vectors (without proofs); Cayley-Hamilton"s theorem (without proof) and its applications.	07 Hrs
2	**Partial Differentiation:** Partial derivatives of first and higher orders; Homogeneous functions– Euler's Theorem for functions containing two and three variables (with proofs); Total derivatives; Change of variables.	07 Hrs
3	**Applications of Partial differentiation:** Jacobians properties; Taylor's and Maclaurin's theorems (without proofs) for functions of two variables; Maxima and minima of functions of two variables; Lagrange's method of undetermined multipliers.	07 Hrs
4	**Reduction Formulae and Tracing of Curves** Reduction formula for $\int_0^{\frac{\pi}{2}} sin^n x\, dx$, $\int_0^{\frac{\pi}{2}} cos^n x\, dx$, and $\int_0^{\frac{\pi}{2}} sin^m x\, cos^m x\, dx$; Tracing of standard curves given in the cartesian, parametric and polar form.	07 Hrs
5	**Multiple Integra**: Double integration in Cartesian and polar co-ordinates; Evaluation of double integrals by changing the order of integration and changing to polar form; Triple integral; Applications of multiple integrals to find area as double integral, volume as triple integral and surface area.	07 Hrs

Text Books:
1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
3. A Course in Engineering Mathematics (Vol I) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.
4. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
5. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books:
1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2. A Text Book of Engineering Mathematics by Peter O'Neil, Thomson Asia Pte Ltd., Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.

Teaching Scheme		Semester I Engineering Chemistry	Examination Scheme	
TH	3	**Course Objectives:**	CA	20
PR	2	1. To impart knowledge of chemistry in Engineering and Technology.	MSE	20
CR	4	2. To enable the student to explain the importance of chemistry in various fields of Engineering. 3. To identify the chemistry concept to lay the groundwork for subsequent studies.	ESE	60

COURSE CONTENT

Unit No.	Topic	Hours
1	**Water Treatment:** Introduction, Hard and soft water, Disadvantages of hard water, Softening of water – Ion exchange process, Hot lime –soda process, Hardness and its determination by EDTA method, Dissolved oxygen (DO) and its determination by Winkler's method, Numerical based on hardness, Sewage water treatment.	07 Hrs
2	**Corrosion and its Control:** Introduction, Fundamental reason for corrosion, Electrochemical corrosion (Wet Corrosion), Mechanism of Wet corrosion, Direct Chemical corrosion (Dry corrosion), Factors affecting the rate of corrosion, Types of corrosion-Pitting corrosion, Microbiological corrosion, Methods to minimize the rate of corrosion- Proper designing, Cathodic, and anodic protection method.	07 Hrs
3	**Fuels and Lubricants:** **Fuels:** Introduction, Classification of fuel, Calorific value of a fuel, Characteristics of a good fuel, Solid fuel- Coal and various types of coal, Analysis of coal- Proximate and Ultimate analysis, Liquid fuel- Refining of petroleum. **Lubricants:** Introduction, classification of lubricants-Solid, Semi-solid, and Liquid lubricants, Properties of lubricants: Physical properties–viscosity, viscosity index, surface tension, Flashpoint, and Fire point, Chemical properties – acidity, saponification value.	07 Hrs
4	**Electrochemistry:** Introduction, Electrical conductance, Conductance measurement by Wheatstone bridge method, Cell constant, Conductometric titrations, Glass electrode and its application for pH measurement, Ostwald's theory of acid-base indicator, Rechargeable batteries i) Lithium-ion battery ii) Lithium battery, Fuel cell (H_2-O_2), Advantages of fuel cell.	08 Hrs

5   **Instrumental Methods of Analysis:** UV-Visible spectroscopy-Introduction,   07 Hrs
Laws of absorption -Beer's - Lambert's law, Instrumentation and working of double beam spectrophotometer. Flame Photometry (Flame emission spectroscopy): Introduction, Principle, and Working. Chromatography: Introduction, Classification, Thin layer chromatography (TLC), Brief discussion on IR spectroscopy.

Text Books:
1. Jain P. C., Jain Monica, Engineering Chemistry, Dhanpat Rai; Sons, Delhi, 1992.
2. Bhal &Tuli, Textbook of Physical Chemistry, S. Chand; Company, New Delhi.
3. Shikha Agarwal, Engineering Chemistry- Fundamentals and Applications, Cambridge Publishers - 2015.
4. Gurudeep Chatwal and Sham Anand, Instrumental methods of Chemical Analysis, Himalaya Publishing House, New Delhi.

Reference Books:
1. Barrow G.M., Physical Chemistry, McGraw-Hill Publication, New Delhi.
2. O. G. Palanna, Engineering Chemistry, Tata McGraw-Hill Publication, New Delhi.
3. WILEY, Engineering Chemistry, Wiley India, New Delhi 2014.
4. S.S.Dara, Engineering Chemistry, McGraw Hill Publication, New Delhi.
5. Willard, Hobart H.; Merritt, Lynne L., Jr.; Dean, John A. Instrumental Methods of Analysis, American Chemical Society.

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Engineering Chemistry Lab (2 Hrs/Week, Credit 1)

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List of Experiments: (Perform any 9 – 10 Experiments)
1. Determination of Hardness of water sample by EDTA method.
2. Determination of Chloride content in a water sample by precipitation titration method.
3. Determination of Dissolved Oxygen in water by Iodometric method.
4. Determination of Percent purity of Bleaching Powder.
5. pH – metric Titration (Acid-Base titration)
6. Conductometric Titration (Acid-Base titration)
7. Surface tension
8. Viscosity
9. To determine the Acidity of the water sample.
10. To determine the Calorific value of a fuel.
11. Determination of the Acid value of an oil sample.
12. Determination of the Saponification value of an oil sample.
13. To verify Beer's-Lambert's law.
14. To determine the Alkalinity water sample.
15. Determination of the rate of corrosion of metal.

16. To determine the maximum wavelength of absorption of a given solution by a colorimeter.
17. Experiment on Chromatography.

Teaching Scheme		Semester I Digital Electronics	Examination Scheme	
TH	3	**Course Objectives:** 1. To acquaint the students with the fundamental principles of two-valued logic and various devices to implement logical operations on variables. 2. To lay the foundation for further studies in areas such as communication, VHDL, and computer. 3. Understand the principles of asynchronous counters and design them to meet specific counting requirements. 4. Solve real-world problems related to arithmetic operations, code conversion, counter applications, and other digital logic scenarios.	CA	20
PR	2		MSE	20
CR	4		ESE	60

COURSE CONTENT

Unit No.	Topic	Hours
1	**Introduction:** Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates.	07 Hrs
2	**Number Systems:** binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes	07 Hrs
3	**Combinational Logic Design:** Standard representations for logic functions, k map representation of logic functions (SOP and POS forms), minimization of logical functions for min-terms and max-terms (upto four variables), don't care conditions	07 hrs
4	**Design Examples:** Arithmetic Circuits, BCD-to-7 segment decoder, Code converters. Adders and their use as subtractors, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Design of Multiplexers and Demultiplexers, and Decoders.	07 Hrs
5	**Sequential Circuits and Systems:** 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J-K-T, and D-types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, a special counter IC's, asynchronous sequential counters, applications of counters.	07 Hrs

Text Book:
1. R. P. Jain, Modern Digital Electronics, McGraw Hill Education, 2009.

2. M. Morris Mano, Digital Logic and Computer Design 4th edition, Prentice Hall of India, 2013.
3. Anand Kumar, Fundamentals of digital circuits 1st edition, Prentice Hall of India, 2001.
4. Pedroni V.A., Digital Circuit Design with VHDL, Prentice Hall India, 2nd Edition 2001.

Digital Electronics Lab (2 Hrs/Week, Credit 1)

List of Experiments:

1. Study of gates – AND; OR; NOT; NAND; NOR; EX-OR; EX-NOR.

2. Verification of Boolean Theorems using basic gates.

3. Design a circuit to convert a binary number to its two's complement representation.

4. Design and realize a given function using K-maps and verify its performance.

5. Verify

    a. Demorgan's Theorem for 2 variables.

    b. The sum-of product and product-of-sum expressions using universal gates.

6. Design and implement

    a. Full Adder using basic logic gates.

    b. Full subtractor using basic logic gates.

7. Implementation of 4x1 multiplexer using Logic Gates.

8. To verify the truth tables of S-R; J-K; T and D type flip flops.

9. Design, and Verify the 4- Bit Synchronous Counter.

10. Design, and Verify the 4-Bit Asynchronous Counter.

11. Design and implementation of a simple digital system (Mini Project).

Teaching Scheme		Semester I C Programming	Examination Scheme	
TH	1	**Course Objectives:**	CA	60
PR	2	1. To give a broad perspective about the uses of computers in the engineering industry and C Programming.	MSE	-
CR	2	2. To develop the basic concept of algorithm, algorithmic thinking, and flowchart.	ESE	40
		3. To apply C programming language to implement various algorithms and develop general programming concepts and terminology.		
		4. To make familiar the more advanced features of the C language.		
		5. To identify tasks in which the numerical techniques learned are applicable, apply them to write programs, and hence use computers effectively to solve the task.		

COURSE CONTENT

Unit No.	Topic	Hours
1	**Process of programming:** Editing, Compiling, Error Checking, executing, testing, and debugging programs, IDE commands, Eclipse for C Program development, Flowcharts, and Algorithms.	04 Hrs
2	**Types, Operators, and Expressions:** Variable names, Data types, sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators, and expressions, conditional expressions precedence and order of evaluation.	07 Hrs
3	**Control Flow:** Statements and Blocks. If-else, else-if switch Loops while and for, do-while break and continue goto and Labels; Functions and Program Structure: Basic of functions, functions returning non-integers external variables scope rules.	07 Hrs
4	**Arrays in C:** Initializing and accessing elements from one-dimensional arrays and two-dimensional arrays, Initializing character arrays, and multidimensional arrays.	07 Hrs
5	**Structures C:** Basics of structures, structures, and functions arrays of structures, Pointer in C; Pointers to integers, characters, floats, arrays, structures.	07 Hrs

Text / Reference Books:
1. Brain W. Kernighan & Dennis Ritchie, The C Programming Language, Prentice Hall, 2nd Edition, 1988.

2. R. S. Bichkar, Programming with C, Orient Blackswan, 1st Edition, 2012.
3. Herbert Schildit, C The Complete Reference, McGraw-Hill Publication, 2000.
4. Balguruswamy, Programming in C, McGraw Hill Education India Private Limited; Seventh edition, 2017.
5. Yashwant Kanitkar, Let Us C, 16th Edition, BPB Publications, 2018.

C Programming Lab (2 Hrs / Week, Credit 1)

At least 10 experiments should be performed from the following list.

List of Experiments:

1. Assignment on the Flowchart and algorithm.
2. A Simple program to display a "Hello world" message on the screen.
3. A Program to take input from the user and display the value entered by a user on screen.
4. Basic example for performing different C Operations using an operator. (With and without using scanf()).
5. Basic Program on Operators. (Using scanf()).
    a. Program to find and print the area, perimeter, and volume of geometric objects.
    b. Program to check whether a number entered by the user is a Perfect number.
6. Program to find the maximum and minimum between two numbers the user gives using if-else and conditional Operators.
7. Program to swap two numbers.
8. Program to print the square and factorial of an entered number using a while loop.
9. Program to check whether a number is a Palindrome number.
10. Program to check Armstrong number.
11. Program to check and generate prime numbers up to n.
12. Program to find the GCD of two entered numbers.
13. Program to find maximum and minimum from n entered numbers.
14. Program to print alternate numbers from n entered numbers.
15. Program to print addition, subtraction, and multiplication of Matrices.
16. Program to find the length of the string. (With and without using the library function).
17. Programs demonstrating the use of Structures, Arrays of Structures, and Structure containing arrays.
18. Programs demonstrating pointers to integers, floats, char, strings, structures, and Arrays.

Teaching Scheme		Semester I Yoga	Examination Scheme	
TH	1	**Course Objectives:**	CA	60
PR	2	1. To apply the techniques in yoga for self-improvement and managing emotions, stress, and life.	MSE	-
CR	2	2. Analyze the concepts of First and Second Wave Positive Psychology and their relevance to personal well-being.	ESE	40
		3. Develop a comprehensive understanding of the synergy between Yogic practices and Positive Psychology interventions.		

COURSE CONTENT

Unit No.	Topic	Hours
1	Managing Self through Yoga, Why Positive Psychology and Yoga in this Course? Positive Psychology: First and Second Wave, Yoga from the Lens of Positive Psychology, Yogic Perspective of Positive Events and Positive Institutions, Yogic Perspective of Governance and Micro Macro Integration of Life.	05 Hrs
2	Health and Wellbeing: Perspectives from Positive Psychology, Yoga and Ayurveda, Human Self and Ladder of Joy: Yogic, Sankhya and Vedantic Perspective, TattvaBodha and Indrajaya: Ways of Attaining Wellbeing, Dharmah Kriya, and Sukhayu-Hitayu: Ways of Attaining Wellbeing.	06 Hrs
3	Kleshas: The Obstacles on the Way of Attaining Wellbeing, Shat Sampatti: The Means to Surpass the Obstacles on the Way of Attaining Wellbeing, Realms and Types of Interventions for Managing Self and Career, Food as the First Intervention for Managing Self, Asanas as the Intervention for Managing Self and Career.	02 Hrs
4	Prana and Types of Pranayam, Pranayams as the Intervention for Managing Self and Career, Pratyahara as the Intervention for Managing Self and Career.	07 Hrs
5	Yogic Intervention for Managing Emotions, Yogic Intervention for Making Mind a Friend.	04 Hrs

Text Books:
1. Rao, K. R., & Paranjpe, A. C. (2016), Psychology in the Indian tradition, Springer India.
2. Parker, S. (2015). Clearing the Path: The Yoga Way to Clear and Pleasant Mind. Lotus Press.
3. Cornelissen, M. (2011). Foundations of Indian Psychology, vol. 2, Practical Applications. Pearson Education India.

Semester - II

Teaching Scheme		Semester II Probability and Statistics	Examination Scheme	
TH	3	**Course Objectives:**	CA	20
PR	-	1. To explain basic concepts in statistics and probability.	MSE	20
		2. To describe various probabilistic distributions.		
CR	3	3. To apply regression and correlation techniques.	ESE	60

COURSE CONTENT

Unit No.	Topic	Hours
1	**Probability Theory** Definition of probability: classical, empirical, and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes' theorem of inverse probability, Properties of probabilities with proofs, Examples.	10 Hrs
2	**Random Variable and Mathematical Expectation:** Random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs.	06 Hrs
3	**Theoretical Probability Distributions:** Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution, Examples.	10 Hrs
4	**Correlation:** Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient, Probable errors.	06 Hrs
5	**Linear Regression Analysis:** Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient.	06 Hrs

Text Books:
1. S. C. Gupta, Fundamentals of Statistics, Himalaya Publishing House, 7th Revised and Enlarged Edition, 2016.
2. G. V. Kumbhojkar; Probability and Random Processes, C. Jamnadas and Co., 14th Edition, 2010.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

4. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2010.
5. G. Haribaskaran; Probability, Queuing Theory and Reliability Engineering, Laxmi Publications, 2nd Edition, 2009.
6. Murray Spiegel, John Schiller, R. ALU Srinivasan, Probability And Statistics, Schaum's Outlines, 4th Edition, 2013.

Teaching Scheme			Semester II Communication Skills	Examination Scheme	
TH	2	**Course Objectives:**		CA	20
PR	2	1. To know and apply speaking and writing skills in professional and social situations.		MSE	20
CR	3	2. To Overcome Mother Tongue Influence and demonstrate a neutral accent while exercising English.		ESE	60
		3. To know and apply communication skills for Presentations, Group Discussions, and interpersonal interactions.			
		4. To know and apply grammar correctly during Speaking and Writing situations, especially in context with Presentations, Public Speaking, Report writing, and Business Correspondence.			

COURSE CONTENT

Unit No.	Topic	Hours
1	**Communication and Communication Processes**: Introduction to Communication, Forms, and functions of Communication, Barriers to Communication and Overcoming them, Verbal and Non-verbal Communication Reading: Introduction to Reading, Barriers to Reading, Types of Reading: Skimming, Scanning, Fast Reading, Strategies for Reading, Comprehension; Listening: Importance of Listening, Types of Listening, Barriers to Listening.	04 Hrs
2	**Verbal & Non-verbal Communication:** Use of Language in Spoken Communication, Principles and Practice of Group Discussion, Public Speaking (Addressing Small Groups and Making Presentation), Interview Techniques, Appropriate Use of Non-verbal Communication, Presentation Skills, Extempore, Elocution.	04 Hrs
3	**Study of Sounds in English** Introduction to phonetics, Study of Speech Organs, Study of Phonemic Script, Articulation of Different Sounds in English.	02 Hrs
4	**English Grammar** Grammar: Forms of Tenses, Articles, Prepositions, Use of Auxiliaries and Modal Auxiliaries, Synonyms and Antonyms, Common Errors.	05 Hrs
5	**Writing Skills, Reading Skills & Listening Skills** Features of Good Language, Difference between Technical Style and Literary Style, Writing Emails, Formal and Informal English, Technical Reports; Report Writing: Format, Structure, and Types; Letter Writing: Types, Parts, Layouts, Letters and Applications, Use of Different Expressions and Style, Writing Job Application Letter and Resume.	04 Hrs

Text Book:
1. Mohd. Ashraf Rizvi, Communication Skills for Engineers, Tata McGraw Hill.

Reference Books:
1. Sanjay Kumar, Pushp Lata, Communication Skills, Oxford University Press, 2016.
2. Meenakshi Raman, Sangeeta Sharma, Communication Skills, Oxford University Press, 2017.
3. Teri Kwal Gamble, Michael Gamble, Communication Works, Tata McGraw Hill Education, 2010.
4. Anderson Kenneth Joan Maclean and Tony Lynch, *Study Speaking: A Course in Spoken English for Academic Purposes*. 2nd ed. 3rd pr ed. Cambridge: Cambridge University Press, 2007.
5. Aswathappa, K. Organizational Behavior, Himalayan Publication, Mumbai (1991).
6. Atreya N and Guha, Effective Credit Management, MMC School of Management, Mumbai (1994).
7. Balan K. R. and Rayudu C.S., Effective Communication, Beacon New Delhi (1996).
8. Bellare, Nirmala. Reading Strategies. Vols. 1 and 2. New Delhi. Oxford University Press, 1998.
9. Bhasker, W. W. S & Prabhu, N. S.: English through Reading, Vols. 1 and 2, Macmillan, 1975.
10. Black, Sam. Practical Public Relations, E.L.B.S. London (1972).
11. Blass, Laurie, Kathy Block, and Hannah Friesan. Creating Meaning. Oxford: OUP, 2007.
12. Bovee Courtland, L and Thrill, John V. Business Communication, Today McGraw Hill, New York, Taxman Publication (1989).

Communication Skills Lab (2 Hrs / Week, 1 Credit)

List of Experiments:
1. How to introduce oneself ? (02 hrs)
2. Know your friend (02 hrs)
3. Introduction to Phonemic symbols (02 hrs)
4. Articulation of sounds in English with proper manner (02 hrs)
5. Practice and exercises on articulation of sounds (02 hrs)
6. Read Pronunciations/transcriptions from the dictionary (02 hrs)
7. Practice and exercises on pronunciations of words (02 hrs)
8. Introduction to stress and intonation (02 hrs)
9. Rapid reading sessions (02 hrs)
10. Extempore (02 hrs)
11. Group discussion (02 hrs)
12. Participating in a debate (02 hrs)
13. Presentation techniques (02 hrs)

14. Interview techniques (02 hrs)

Teaching Scheme		Semester II Engineering Mathematics - II	Examination Scheme	
TH	3	**Course Objectives:**	CA	20
PR	-	1. To know and discuss the need and use of complex variables to find roots, separate complex quantities, and establish a relation between circular and hyperbolic functions.	MSE	20
CR	3		ESE	60
		2. To understand and solve first and higher-order differential equations and apply them as mathematical modeling in electric and mechanical systems.		
		3. To determine the Fourier series representation of periodic functions over different intervals.		
		4. To Demonstrate the concept of vector differentiation and interpret the physical and geometrical meaning of gradient, divergence & curl in various engineering streams.		
		5. To know and apply the principles of vector integration to transform line integral to surface integral, surface to volume integral & vice versa using Green's, Stoke's, and Gauss divergence theorems.		

COURSE CONTENT

Unit No.	Topic	Hours
1	**Complex Number:** Definition and geometrical representation; De-Moivre's theorem (without proof); Roots of complex numbers by using De-Moivre's theorem; Circular functions of a complex variable – definition; Hyperbolic functions; Relations between circular and hyperbolic functions; Real and imaginary parts of circular and hyperbolic functions; Logarithm of Complex quantities.	07 Hrs
2	**Ordinary Differential Equations of First Order and First Degree and Their Applications:** Linear equations; Reducible to linear equations (Bernoulli's equation); Exact differential equations; Equations reducible to exact equations; Applications to orthogonal trajectories, mechanical systems, and electrical systems.	07 Hrs
3	**Linear Differential Equations with Constant Coefficients:** Introductory remarks - complementary function, particular integral; Rules for finding complementary functions and particular integrals; Method of variation of parameters; Cauchy's homogeneous and Legendre's linear equations.	07 Hrs
4	**Fourier Series:** Introductory remarks, Euler's formula; Conditions for Fourier series expansion: Dirichlet's conditions; Functions having points of	07 Hrs

discontinuity; Change of interval; Odd and even functions expansions of odd and even periodic functions; Half-range series.

5	**Vector Calculus:** Scalar and vector fields: Gradient, divergence, and curl; Solenoidal and irrotational vector fields; Vector identities (statement without proofs); Green's lemma, Gauss divergence theorem, and Stokes theorem (without proofs)	07 Hrs

Text Books:
1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
3. A Course in Engineering Mathematics (Vol II) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.
4. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Vidyarthi Griha Prakashan, Pune.
5. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books:
1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2. A Text Book of Engineering Mathematics by Peter O'Neil, Thomson Asia Pte Ltd., Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.

Teaching Scheme		Semester II Engineering Physics	Examination Scheme	
TH	3	**Course Objectives:** 1. To provide a firm grounding in the basic physics principles and concepts to resolve many Engineering and Technological problems. 2. To understand and study the Physics principles behind the developments of engineering materials.	CA	20
PR	2		MSE	20
CR	4		ESE	60

COURSE CONTENT

Unit No.	Topic	Hours
1	**Engineering Optics:** Interference: in a thin film due to reflected light, wedge-shaped film, Newton's Rings, Applications, Polarization: types of polarization, optical activity, specific rotation, and Laurentz half shade polarimeter, Lasers: characteristics, Gas Laser, solid state Laser, and semiconductor lasers, Applications of Lasers, Optical fibers: Acceptance cone, Numerical aperture, applications, Oscillations: free oscillations, forced oscillations and damped oscillation, resonance and it's condition.	10 Hrs
2	**Quantum Mechanics:** Wave and particle duality of radiation – de Broglie concept of matter waves – Wave function and its physical significance, Heisenberg's uncertainty principle and its application – Schrodinger's wave equation – eigen values and eigen functions, particle confined in one dimensional infinite square well potential, Introduction to quantum computing.	06 Hrs
3	**Electromagnetism:** Differential and integral calculus: Operator, Concept of gradient, divergence, and curl, Ampere's law, Faraday law, Gauss–Divergence theorem, integral and differential forms of Maxwell equations and their physical significance, EM waves in free space. Dielectrics: polarization, Types of Dielectric polarization, dielectric constant, polar, non-polar dielectrics.	06 Hrs
4	**Crystal Structure:** Fundamental concepts, Crystal systems Cubic structure: Number of atoms, coordination number, packing fraction, Atomic radius, Miller indices, the relation between 'ρ' and 'a', Nuclear Physics: Nuclear properties Introduction to mass defect; packing fraction, Nuclear reaction: Q value of Nuclear reaction, Radioactivity – properties of α, β, and γ rays, GM Counter.	06 Hrs
5	**Physics of Advanced Materials:** Types of magnetic materials, ferrites and garnets, magnetic domain and hysteresis curve, Semiconductors, conductivity of semiconductors, Hall Effect Superconductors: definition – Meissner effect – type I & II superconductors, Nanomaterials: introduction and properties –	08 Hrs

synthesis: top-down and bottom-up approach, Introduction to SCADA, XRD, FESEM, VSM, and applications.

Text / Reference Books:
1. Introduction to Electrodynamics –David R. Griffiths.
2. Concept of Modern Physics – Arthur Beizer. Tata McGraw-Hill Publishing Company Limited.
3. Optics –Ajoy Ghatak. McGraw Hill Education (India) Pvt. Ltd.
4. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan. New Age International Pvt. Ltd.
5. Solid State Physics – A.J. Dekker. MacMillan India –Limited.
6. The Feynman Lectures on Physics Vol I, II, III.
7. Introduction to solid state physics – Charles Kittel. John Willey and Sons
8. Engineering Physics – M. N. Avadhanulu and P.G. Kshirsagar.S.Chand and Company LTD.
9. Engineering Physics - R K. Gaur and S. L. Gupta, DhanpatRai Publications Pvt. Ltd.; New Delhi.
10. Fundamental of Physics - Halliday and Resnik. Wiley Eastern Limited.
11. Nanotechnology: An Introduction To Synthesis, Properties, And Applications of Nanomaterials- Thomas Varghese, K. M. Balakrishna

Engineering Physics Lab (PR 2 Hrs / Week, Credit 1)

At least 08 experiments should be performed from the following list.

1. Newton's rings - Determination of radius of curvature of Plano-convex lens/wavelength of light.
2. Wedge Shaped film - Determination of thickness of thin wire.
3. Half shade Polarimeter - Determination of specific rotation of optically active material.
4. Laser - Determination of wavelength of He-Ne laser light.
5. Magnetron Tube - Determination of 'e/m' of electrons.
6. G. M. Counter - Determination of operating voltage of G.M. tube.
7. Crystal Plane – Study of planes with the help of models related to Miller Indices.
8. Hall Effect - Determination of Hall Coefficient.
9. Four Probe Method - Determination of resistivity of semiconductor.
10. Measurement of Band gap energy of Semiconductors.
11. Experiment on fiber optics.
12. B-H Curve Experiment.
13. Experiments on SCADA.

Teaching Scheme		Semester II Object Oriented Programming in C++	Examination Scheme	
TH	3	**Course Objectives:**	CA	20
		1. To explain the fundamental properties of C++.		
PR	2	2. To describe the usefulness of basic OO abstractions like class, Methods, and Interfaces.	MSE	20
CR	4		ESE	60
		3. To apply code reuse techniques through inheritance.		
		4. To apply design OO libraries for designing UI and other programmatic features.		

COURSE CONTENT

Unit No.	Topic	Hours
1	**Introduction to Object Oriented Programming and Objects and Classes:** Need of object-oriented programming, The object-oriented approach, Characteristics of object-oriented languages, class, Objects as data types, Constructors and Destructor, Objects as function arguments, Returning objects.	07 Hrs
2	**Operator Overloading and Type Conversion:** Operator functions, Using Overloaded operators (Unary and Binary), Global Operator function, Friend Functions, Friend Classes, Overloading Subscript operator, Overloading Shift operator for I/O. Type Conversion for classes: Conversion Function, Conversion Constructors.	07 Hrs
3	**Polymorphism:** Types of Polymorphism, Virtual functions, Dynamic binding, and pure virtual functions, Friend functions, this pointer.	07 Hrs
4	**Inheritance:** Derived Classes, Member access, Constructing and Destructing Derived classes, Inheritance Types: Single, Multilevel, Multiple, Hierarchical, and Hybrid Inheritance. Abstract Classes, Constructors in Derived Classes.	07 Hrs
5	**Working with Files and Exception Handling:** Classes for File Streaming Operations, Opening and Closing Files, Detecting End-of-File, File Modes, File Pointer, Sequential Input and Output Operations, Updating a File, Error Handling during File Operations. Basic of Exception Handling, Exception Handling Mechanism, Throwing Mechanism, Catching Mechanism, and Specifying Exception.	07 Hrs

Text Books:
1. E. Balagurusamy, Object Oriented Programming with C++, McGraw-Hill Publication, 6th Edition, 2013.
2. Dr. B. B. Meshram, Object Oriented Paradigms with C++ Beginners Guide for C and C++, SPD Publication, 1st Edition, 2016.

3. Rajesh R. Shukla, Object-Oriented Programming in C++, Wiley India Publication, 1st Edition, 2008.

Reference Books:
1. Robert Lafore, Object Oriented Programming in C++, Sams Publishing, 4th Edition, 2001.
2. Bjarne Stroustrup, The C++ Programming Language, Addison-Wesley Publication, 4th Edition, 2013.
3. P. J. Deitel, H. M. Deitel, C++ How to Program, PHI Publication, 9th Edition, 2012.
4. John Hubbard, Programming with C++, Schaum's Outlines, McGraw-Hill Publication, 2nd Edition, 2000.
5. Nicolai M. Josuttis, Object-Oriented Programming in C++, Wiley Publication, 1st Edition, 2002.

Object Oriented Programming Lab (2 Hrs/Week, Credit 1)

List of Experiments:
1. Programs on Operators, Arithmetic Promotion, Method Calling.
2. Programs on dealing with Arrays.
3. Programs on Classes: String and Math.
4. Programs on Inheritance.
5. Programs on Polymorphism.
6. Programs on Garbage collection, packaging, access Modifiers, and static and abstract modifiers.
7. Programs on Interfaces block initializers, final Modifiers, and static and dynamic binding.
8. Programs on file handling and stream manipulation.
9. Programs on Dynamic Polymorphism.
10. Programs on Dynamic Memory Management.
11. Programs on Exception Handling.

Teaching Scheme		Semester II Web Site Development and MS Office	Examination Scheme	
TH	1	**Course Objectives:** 1. To design static websites through basic HTML and CSS. 2. To apply to MS Office for office automation work. 3. To be able to create and share presentations. 4. To be able to manage and store data in a spreadsheet.	CA	60
PR	2		MSE	-
CR	2		ESE	40

COURSE CONTENT

Unit No.	Topic	Hours
1	**Web Site development Essentials:** Overview of Web Design Concepts, Web Project Management Fundamentals, Web Site Development Process, HTML and the Evolution of Markup languages, HTML basic tags, Web Page Layout, and Elements, Create Hyperlinks, Create Tables, Create Web Forms, Image Inserting Techniques, Create Frames, GUI HTML Editors, Site Content and Metadata.	07 Hrs
2	**Cascading Style Sheets:** Cascading Style Sheets for Web page design, Creating CSS rules, Format Text with CSS, Use of CSS Selectors, Embed Style Sheets, and Attach External Style Sheets, Using CSS with Tables: Insert and Styling Tables, Import Table Data, Style Tables with CSS, Sort Data in Table.	06 Hrs
3	**Working with Word Document:** Text Basics, Text Formatting, and saving files, Working with Objects, Header & Footers, Bullet and Numbered lists, Tables, Style and Content, Merging Documents.	06 Hrs
4	**Working with Sheet:** Introduction to the workbook, Formatting workbook, Perform Calculations with Functions, Sort and Filter Data, Create Effective Charts to Present Data Visually, Protecting and Sharing the workbook, Use Macros to Automate Tasks.	07 Hrs
5	**Working with Presentation:** Setting Up PowerPoint Environment, Creating slides and applying themes, Working with bullets and numbering, Working with Objects, Hyperlinks, and Action Buttons, Working With Movies and Sounds, Using SmartArt and Tables, Animation and Slide Transition, Using slide Master, Slide show option.	07 Hrs

Text Books:
1. HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, Ajax, PHP, and jQuery, 2nd Edition. (English, Paperback, DT Editorial Services).

Reference Books:

1. Robin Nixon, Learning PHP, MySQL & JavaScript with j Query, CSS & HTML5 Paperback by O'reilly Pub.
2. E. Robson, E. Freeman, Head First HTML & CSS, O'Reilly Media, 2nd Edition, 2012.

Teaching Scheme		Semester II Data Science with Python	Examination Scheme	
TH	1	**Course Objectives:**	CA	60
PR	2	1. To apply the basic Python constructs for modeling data science problems.	MSE	-
CR	2	2. To apply Python for data analysis purposes. 3. To apply Python for data visualization purposes.	ESE	40

COURSE CONTENT

Unit No.	Topic	Hours
1	**Basics of Python:** Introduction Python development tools Colab/Spyder/, IDLE, Setting working Directory, Creating and saving a script file, File execution, clearing console, removing variables from environment, clearing environment Commenting script files, Variable creation, Arithmetic, and logical operators, Data types and associated operations.	06 Hrs
2	**Control Structures:** if-else family, for loop, for loop with if break, while loop, Functions.	06 Hrs
3	**Data Structures:** Lists, Tuples, Dictionary, Sets, Numpy, Array, Matrix and associated operations, Linear algebra and related operations.	06 Hrs
4	Pandas data frame and data frame related operations on a dataset Reading files, Exploratory data analysis, Data preparation and preprocessing, Data visualization using matplotlib and seaborn libraries Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot. **Case Study Regression:** Predicting the price of pre-owned cars, Classification Classifying personal income.	07 Hrs
5	Introduction to data analysis libraries such as ScikitLearn, and TensorFlow.	04 Hrs

Text Books:
1. Introduction to linear algebra - by Gilbert Strang.
2. Applied statistics and probability for engineers – by Douglas Ontgomery.
3. Mastering Python for data science, Samir Madhavan.

Data Science with Python Lab (2 Hrs/Week, Credit 1)

List of Experiments:

Python:
1. Write a program to purposefully raise Indentation Error and Correct it.
2. Write a program to compute distance between two points taking input from the user (Pythagorean Theorem) .
3. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10.
4. Write a program using a for loop that loops over a sequence.
5. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
6. Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
7. Write a program combine_lists that combines these lists into a dictionary.
8. Write a program to compute the number of characters, words and lines in a file.
9. Find mean, median, mode for the given set of numbers in a list.
10. Write a function reverse to reverse a list. Without using the reverse function.

Data Science:
1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
2. Working with Numpy arrays.
3. Working with Pandas data frames.
4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
   a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
   b. Also compare the results of the above analysis for the two data sets.
6. Apply and explore various plotting functions on UCI data sets.
   a. Normal curves
   b. Density and contour plots
   c. Correlation and scatter plots
   d. Histograms
   e. Three dimensional plotting
7. Visualizing Geographic Data with Basemap.

Teaching Scheme		Semester II Hindustani Music	Examination Scheme	
TH	-	**Course Objectives:**	CA	60
PR	2	1. To appreciate the diversity and uniqueness in Hindusthani Music	MSE	-
CR	1	2. Understanding Raga Concepts and Classification. 3. Study of Different Musical Instruments. 4. To explore the Principles of Tala and Laya.	ESE	40

COURSE CONTENT

Unit No.	Topic	Hours
1	Hindustani Music - A World of Colour, Romance, and History, Classical or Shastriya – What's in a Name!, Dhrupad, Khayal and Instrumental Music – A Bird's-eye View. Hindustani Music as Raga Sangeet, The Textual Tradition, Swara and Shruti: Tone and Microtone, Swara and Shruti in the Textual Tradition. Tanpura – The King of Overtones, Entering the World of Raga – Raga and Swara, The World of Raga – 2: Strong and Weak Notes, The World of Raga – 3: Ornament, The World of Raga – 4: Paths of a Raga, Raga and Time Association	05 Hrs
2	Raga Lakshana or Features of Raga, Defining Raga, Classification of Ragas – the Mela or Thaat System, Classification of Ragas – the Raagaanga System, Classification of Ragas – the Raga Ragini system. Extending the Raga Corpus – Winds from the South, Extending the Raga Corpus – Jod Ragas, Principles of Time in Hindustani Music – Tala and Laya, Some Aspects of Tala and a Few Important Tala-s, Tabla as Keeper of Tala in Khayal, Khayal-A Compositional Form, Some Contemporary Composers of Khayal.	06 Hrs
3	The Vilambit Khayal Improvisation in Khayal: Elements of Raga Vistaar., The Eight Limbs of Ashtanga of Khayal and the nature of Tabla accompaniment., A Typical Khayal Presentation, Raga Profiles as Captured in Bandish Gharanas of Hindustani Music – Introduction Gharanas of Hindustani Music – Early Masters Gharanas of Hindustani Music – Twentieth Century masters Gharanas of Hindustani Music – Melodic accompaniment in Khayal The Harmonium as a solo and accompanying instrument.	06 Hrs

| 4 | Dhrupad: style and structure, alaap, compositional forms, song texts The Enchanting World of Thumri | 07 Hrs |

Instrumental Music – an Introduction The Sarod: A Lecture demonstration by Pt Suresh Vyas.

The Sitar: A Lecture demonstration by Dr Supriya Shah

The Art of Tabla: Guest Lectures by Dr Aneesh Pradhan

Bhatkhande and Paluskar - The 20th Century Reformers of Hindustani Music.

Hindustani Music in a World of Click-baits and a Million Views.

Text / Reference Books:

1. Music Contexts: A Concise Dictionary of Hindustani Music by Ashok Ranade, Bibliophile South Asia, 2006
2. Keywords and Concepts: Hindustani Classical Music by Ashok Ranade, Promilla, 2012
3. Music In India: The Classical Traditions – Bonnie C. Wade, Manohar Publishers, and Distributors, revised edition 2021
4. Lost world of Hindustani Music by Kumar Prasad Mukherjee, Penguin India, 2006 Sources on the internet:
5. https://www.swarganga.org/ - for brief discussions on a range of topics in Hindustani Music.
6. www.parrikar.org – contains curated raga clips and raga descriptions
7. Category: Hindustani music terminology - Wikipedia
8. https://mohannadkarni.org includes concert reviews, musician profiles
9. Pillars of Hindustani music: Devadhara, Bī. Āra: Free Download, Borrow, and Streaming: Internet Archive
10. Microsoft Word - Richard Widdess - Raga March 06.doc (soas.ac.uk)
11. For guided listening:
    a. Aneesh Pradhan's articles on Scroll.in: Aneesh Pradhan | Scroll. in
    b. Curated exhibits on Google Arts and Culture: Archive of Indian Music, Bangalore, India — Google Arts & Culture and Baithak Foundation, Pune, India — Google Arts & Culture.

Teaching Scheme		Exit Course **Mobile Application Development for iOS Devices**	Examination Scheme	
TH	1	**Course Objectives:**	CA	60
		1. To facilitate students to understand iOs SDK.		
PR	6	2. To help students to gain a basic understanding of iOs application development.	MSE	40
CR	4	3. To inculcate working knowledge of the iOS Studio development tool.	ESE	-

COURSE CONTENT

Unit No	Topic	Hours
1	Swift (Constants and Variables, Data Types, Operators, Control Flow), Xcode and Xcode Playgrounds, Interface Builder, Using API Reference Documentation.	06 Hrs
2	Swift (Strings, Functions, Structures, Classes, Collections, Loops), Controls, Events, Views, Images, View Controllers, Stack Views, AutoLayout	06 Hrs
3	Swift (Optionals, Type Casting, Guard, Scope, Enumerations), Segues, Navigation, Tab Bars, View Controller Life Cycle	06 Hrs
4	Swift (Protocols), App Lifecycle, Model-View-Controller, Scroll Views, Table Views, Simple Data Persistence, System-Provided View Controllers	06 Hrs
5	Swift (Closures, Extensions), UI Animation, HTTP and URL fetching, JSON Decoding, Concurrency AR Apps (3D Scenes, Detecting Planes, User Interactions, Image Recognition)	06 Hrs

Reference Books:
1. Vandad Nahavandipoor, *iOS 10 Swift Programming Cookbook*, O'Reilly Media, 1st Edition, 2015.
2. Craig Clayton, *iOS 10 Programming for Beginners*, Packt Publishing, 1st Edition, 2016.
3. Dan Pilone, Tracey Pilone, *Head First iPhone and iPad Development*, O'Reilly Media, 3rd Edition, 2013.

Teaching Scheme		Exit Course **Mobile Application Development for Android Devices**	Examination Scheme	
TH	1	**Course Objectives:**	CA	60
		1. To facilitate students to understand android SDK.		
PR	6	2. To help students to gain a basic understanding of Android application development.	MSE	40
CR	4	3. To inculcate working knowledge of the Android Studio development tool.	ESE	-

COURSE CONTENT

Unit No.	Topic	Hours
1	**Introduction to Android:** The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building your First Android application, Understanding Anatomy of Android Application, Android Manifest file.	02 Hrs
2	**Android Application Design Essentials:** Anatomy of an Android application, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.	02 Hrs
3	**Android User Interface Design Essentials:** User Interface Screen Elements, Designing User Interfaces with Layouts, Drawing, and Working with Animation.	02 Hrs
4	Testing Android applications, Publishing Android applications, Using Android preferences, Managing Application resources in a hierarchy, and working with different types of resources.	02 Hrs
5	**Using Common Android APIs:** Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Applications to the World.	02 Hrs

Text Book:
1. Lauren Darcey and Shane Conder, "Android Wireless Application Development," Pearson Education, 2nd ed. (2011)

Reference Book:
1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd.
2. Mark L Murphy, "Beginning Android," Wiley India Pvt Ltd.
3. Barry Burd; Android Application Development All in one for Dummies, Edition: I.

List of Experiments:

1. Install Android Studio and Run Hello World
2. First Interactive UI
3. Using different Layouts
4. Working with Textview Elements
5. Create and Start Activities
6. Activity Lifecycle and Saving State
7. Using the Debugger
8. User Input Controls
9. Menus
10. Screen Navigation Using the App Bar and Tabs
11. Create a RecyclerView
12. Drawables, Themes, and Styles
13. Supporting landscape, multiple screen sizes
14. Create an AsyncTask
15. BroadcastReceiver
16. Transferring data efficiently (Job Scheduler)
17. Querying the SQLite database and the basics of SQLite and MySQL
18. Adding, Updating, and Deleting Content in APP using SQLite Database
19. Use a loader with a content provider
20. Send Data to the Server using PHP and MySQL
21. Publish Your App
22. Project

Teaching Scheme		Exit Course Drone Technology	Examination Scheme	
TH	1	**Course Objectives:**	CA	60
		1. To understand the basics of drone concepts.		
PR	6	2. To learn and understand the fundamentals of drone design, fabrication, and programming.	MSE	40
CR	4		ESE	-
		3. To impart knowledge of flying and operation of drones.		
		4. To know about the various applications of drones.		
		5. To understand the safety risks and guidelines of flying safely.		

COURSE CONTENT

Unit No.	Topic	Hours
1	**Introduction to Drones:** Definition and history of drones, Types of drones and their applications, Drone components and terminology, Regulations and Guidelines for drone usage.	02 Hrs
2	**Drone Design and Assembly:** Design considerations for drone airframe and propulsion systems, Selecting and assembling drone components such as motors, batteries, flight controllers, cameras, Basic wiring, and soldering techniques.	02 Hrs
3	**Drone Motors and ESC:** Working, Types: Brush and Brushless Motors, motor sizing and identification, mounting patterns, thread size, Thrust to Weight ratio, KV ratings, advanced motor selection, Electronic Speed Controller (ESC).	02 Hrs
4	**Flight Mechanics and Dynamics:** Basic principles of flight mechanics, flight controller board, Selection of drone controller with example, Factors affecting drone flight performance and efficiency.	02 Hrs
5	**Applications of Drone:** Overview of commercial and industrial drone applications, Case studies and examples of successful drone deployments, GPS-based navigation systems, Drone Camera Systems, Agro application, Drone Delivery, Future trends and developments in the drone industry.	02 Hrs

Text Books:
1. M. LaFay, Building Drones for Dummies, John Wiley & Sons, Inc., n.d.
2. E. Tooley, Practical Drones: Building, Programming, and Applications, Apress, 2021.
3. D. Levy, Drone Programming: A Guide to Code Your Own Drones, Packt Publishing, n.d.
4. S. K. Kopparthy, Drone Technology: Theory and Practice, Springer, 2020.
5. P. Horowitz and W. Hill, The Art of Electronics, Cambridge University Press, 2015.

6. K. Sundar and R. V. Rajakumar, Multicopters: Principles and Applications, Springer, 2021

Reference Books:
1. D. Saxby, Drone Aerial Photography and Video: Techniques and Stories from the Field, Cengage Learning, 2018.
2. D. McLeod, Getting Started with Drone: How to Build, Fly, and Program Your Own Drone, Apress, 2019.
3. M. A. Banks, Building and Flying Electric Model Aircraft, O'Reilly Media, Inc., 2014.
4. G. C. Camara Leal, Flying Robots: An Introduction to Autonomous Aerospace Systems, Springer, 2017.

Drone Technology Lab

List of Experiments:
1. Study of Drone Frame
2. Study of Motor
3. Study of ESC
4. Study of Flight Controller
5. Learn Soldering Techniques
6. Assembling Drone
7. Drone Flight Control

Teaching Scheme		Exit Course Entrepreneurship: Startup	Examination Scheme	
TH	1	**Course Objectives:**	CA	60
PR	6	1. To analyze various techniques to develop a product prototype.	MSE	40
		2. Conduct effective interviews with potential customers to develop your customer personas.	ESE	-
CR	4	3. To create and describe a value proposition for a specific product.		
		4. To develop a go-to-market (GTM) plan, and determine key metrics, such as customer acquisition costs (CACs).		
		5. To present a viable profit model for a specific product.		
		6. To apply the four-step entrepreneurship framework to a final capstone project.		
		7. To learn Entrepreneurship best practices, and avoid common pitfalls.		

COURSE CONTENT

Unit No.	Topic	Hours
1	The Challenge of the Future, Party Like it's 1999? Value Systems, The Last Mover Advantage.	05 Hrs
2	The Mechanics of Mafia, Thiel's Law, Follow The Money, The Pitch.	06 Hrs
3	If You Build It, Will They Come? After Web 2.0, Secrets, War and Peace.	02 Hrs
4	You Are Not A Lottery Ticket, Seeing Green, Back to the Future, Decoding Ourselves.	07 Hrs
5	Deep Thought, Founder as Victim, Founder as God, Stagnation or singularity?	04 Hrs

Text Books:
1. Thiel, Peter, Masters, Blake; Zero to one: notes on startups or how to build the future; New York: Crown Business, 2014.