DOMBIVLI SHIKSHAN PRASARAK MANDAL'S,

K.V. PENDHARKAR COLLEGE OF ARTS, SCIENCE AND COMMERCE, (AUTONOMOUS)
DOMBIVLI (EAST), DIST. THANE
(Affiliated to University of Mumbai)

<u>Faculty of Science</u>
DEPARTMENT OF COMPUTER SCIENCE
(Programme: Bachelor of Science, B.Sc.)

SYLLABUS FOR

F. Y. B.Sc. – COMPUTER SCIENCE (Semester I and II)

Choice Based Credit System (CBCS)
(as per NEP-2020)
(with effect from the Academic Year: 2023-2024)

BOS Chairperson	**Prof. Dr. K. R. Jagdeo**
Mrs.Smita Sonawane.	**I/C Principal**
CS Department	

F.Y.B.Sc. (Semester -I and II)
Computer Science Syllabus
Credit Based Semester and Grading System
To be implemented from the Academic year 2023-2024
SEMESTER -I

Sr. No	Course code	Course Title	Category	Total Marks	Credits
01	CS23101MM	Programming with Python-I	Major Mandatory	100	2
	CS23102MM	Descriptive Statistics and Introduction to Probability.	Major Mandatory	100	2
	CS23103MM	Practicals of Programming with Python- I and Practical of Descriptive Statistics and Introduction to Probability.	Major Mandatory	100	2
02	CS23104MN	Soft skill Development	Minor	100	2
03	CS23105OE	Discrete Mathematics	Generic / Open Elective(OE)	50	2
	AF23105OE	Direct Tax-I	Generic / Open Elective(OE)	50	2
04	CS23106AE	Soft skill Development practical	Ability Enhancement Courses(AE)	50	2
05	CS23107VS	Practicals of Computer Organization and Design and Discrete Mathematics	Vocational Skill Course (VS)	100	2
06	CS23108IK	Cyber Law in India	Course on Indian Knowledge System(IK)	50	2
07	CS23109SE	Computer Organization and Design	Skill Enhancement Courses(SE)	100	2
08	CS23110VE	Green Technologies-I	Value Education Courses(VE)	50	2
			Total Credit-22		

SEMESTER -II

Sr. No	Course code	Course Title	Category	Total Marks	Credits
01	CS23201MM	Programming with Python-II	Major Mandatory	100	2
	CS23202MM	Statistical Methods and Testing of Hypothesis	Major Mandatory	100	2
	CS23203MM	Practicals of Programming with Python- II and Practical of Statistical Methods and Testing of Hypothesis	Major Mandatory	100	2
02	CS23204MN	Data Structure	Minor	100	2
03	CS23205OE	Calculus	Generic / Open Elective(OE)	50	2
	AF23205OE	Direct Tax -II	Generic / Open Elective(OE)	50	2
04	CS23206AE	practical of Green Technologies-II	Ability Enhancement Courses(AE)	50	2
05	CS23207VS	Practicals of Data Structure and Linux	Vocational Skill Course (VS)	100	2
07	CS23208SE	Linux	Skill Enhancement Courses(SE)	100	2
09	CS23209CC	A.NCC B. NSS C. Performing arts D. Certificates courses E. Sports activities	Co-curricular Course (CC)	50	2
10	CS23210VE	Green Technologies-II	Value Education Courses(VE)	50	2
				Total Credit-22	

Semester I – Theory

CourseCode: CS23101MM	Programming with Python I (Credits : 2 Lectures/Week: 50 min. each)

Learning Objectives :
- The objective of this paper is to introduce various concepts of programming to the students using Python..

Expected Learning Outcomes :
- Students should be able to understand the concepts of programming before actually starting to write programs.
- Students should be able to develop logic for Problem Solving.
- Students should be made familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc.
- Students should be able to apply the problem solving skills using syntactically simple language i.e.**Python (version: 3.X or higher)**

Unit I	**Reasons for Python** as the learner's first programming language. Introduction to the IDLE interpreter (shell) and its documentation. Expression evaluation: similarities and differences compared to a calculator; expressions and operators of types int, float, boolean. Built-in function type. Operator Precedence. **Enumeration of simple and compound statements** The expression statement : The assert statement, whose operand is a boolean expression (values true or false). The assignment statement, dynamic binding of names to values, (type is associated with data and not with names); automatic and implicit declaration of variable names with the assignment statement; assigning the valueNone to a name. The del (delete) statement. **Input/output with print and input functions** Simple & formatted print(%). A statement list (semicolon- separated list of simple statements on a single line) as a single interpreter command. The import statement for already-defined functions and constants. The augmented assignment statement. The built-in help() function. Interactive and script modes of IDLE, running a script, restarting the shell. **The role of indentation** for delimiting the body of a compound statement; calling a previously defined function. Compound data types str, tuple and list (enclosed in quotes, parentheses and brackets, respectively). Indexing individual elements within these types. Strings and tuples are immutable, lists are mutable. Built-in functions min, max, sum. Interactive solution of model problems, (e.g., finding the square root of a number or zero of a function)	**10 L**
Unit II	**The compound statement def :** to define function, advantages of functions, function parameters, formal parameters, actual parameters, global and local variables. **The conditional statements :** if, if-else, if-elif-else. **The iterative statements :** while, while-else, for-else. The range function, the iterative for statement. The continue statement to skip over one iteration of a loop, the break statement to exit the loop.	**10 L**

	Nested compound statements. **Dictionaries:** concept of key-value pairs, techniques to create, update and delete dictionary items. **Problem-solving u**sing compound types and statements.	
Unit III	**Anonymous functions :** Lambda definition **List comprehensions :** In detail various applications, shorthand use. **Brief introduction to object-oriented programming;** using the built-in dir() function, enumerate the methods of strings, tuples, lists, dictionaries. Using these methods for problem-solving with compound types.	**10 L**

Textbooks:

1. Practical Programming: An Introduction to Computer Science Using Python 3, Paul Gries , Jennifer Campbell, Jason Montojo, Pragmatic Bookshelf, 2nd Edition, 2014
2. Programming through Python, M. T Savaliya, R. K. Maurya & G M Magar, Sybgen Learning India, 2020

ICT Reference :

1. https://www.python-course.eu/python3_formatted_output.php
2. https://www.geeksforgeeks.org/python-dictionary/
3. https://realpython.com/python-lambda/

Pedagogy:

1. Traditional teaching can be associated with presentations
2. Projected demo with hands-on will make concept more clear
3. To check their understanding assignments can be taken for debugging & output tracing
4. IDLE & shell can be explain in Lab sessions instead classroom

Course code : CS23102MM	Descriptive Statistics and Introduction to Probability (Credits : 2 Lectures/ Week: 50 min. each)	
Learning Objectives : ● The purpose of this course is to familiarize students with basics of Statistics. ● This will be essential for prospective researchers and professionals to know these basics. **Expected Learning Outcomes :** 1. Enable learners to know descriptive statistical concepts 2. Better understanding of Statistical Concept and data collection in statistical analysis. 3. Enable study of probability concept required for Computer learners.		
Unit I	**Introduction to Statistics:** Advantages and disadvantages. Data collection methods for primary data and secondary data **Data Presentation :** Data types : attribute, variable, discrete and continuous variable Data presentation : frequency distribution, histogram o give, curves, stem and leaf display Data Aggregation : Measures of Central tendency: Mean, Median, mode for raw data, discrete, grouped frequency distribution. **Measures dispersion**: Range, Quartiles, Deciles, percentiles, Quartile deviation, Variance, standard deviation, coefficient of variation for raw data, discrete and grouped frequency distribution, quartiles, Real life examples.	**10L**
Unit II	**Moments:** Raw moments, central moments, relation between raw and central moments **Measures of Skewness and Kurtosis**: based on moments, quartiles, relation between mean, median, mode for symmetric, asymmetric frequency curve. **Correlation and Regression**: bivariate data, scatter plot, correlation, nonsense correlation, Karl pearson's coefficients of correlation, independence. **Linear regression**: fitting of linear regression using least square regression, coefficient of determination, properties of regression coefficients (only statement)	**10L**
Unit III	**Probability:** Random experiment, sample space, events types and operations of events Probability definition: classical, axiomatic, Elementary Theorems of probability (without proof) $\qquad 0 \leq P(A) \leq 1,$ $\qquad P(A \cup B) = P(A) + P(B) - P(A\ B)P\ (A') = 1 -$ $\qquad P(A)$ Conditional probability, 'Bayes' theorem, independence, Examples on Probability	**10L**

Text Book :

1. Trivedi, K.S.(2001) : Probability, Statistics, Design of Experiments and Queuing theory, with applications of Computer Science, Prentice Hall of India, New Delhi.

Additional References :

1. Ross, S.M. (2006): A First course in probability. 6th Ed^n Pearson
2. Kulkarni, M.B., Ghatpande, S.B. and Gore, S.D. (1999): common statistical tests. Satyajeet Prakashan, Pune
3. Gupta , S.C. and Kapoor, K (1987) Fundamentals of Mathematical Statistics, Chand and Sons, New Delhi

ICT Ref. :

1. https://slideplayer.com/slide/6569685/
2. https://slideplayer.com/slide/3489383/
3. http://www.ddegjust.ac.in/studymaterial/mcom/mc-106.pdf
4. https://byjus.com/maths/graphical-representation/
5. http://www.ddegjust.ac.in/studymaterial/mcom/mc-106.pdf
6. http://www.ddegjust.ac.**in/studymaterial/mcom/mc-106.pdf**
7. https://m.youtube.com/watch?v=m9a6rg0tNSM
8. https://www.tutorialspoint.com/statistics/kurtosis.htm
9. http://www.ddegjust.ac.in/studymaterial/mcom/mc-106.pdf
10. https://www.youtube.com/watch?v=8cEB3dWW7IM
11. https://byjus.com/maths/multiplication-rule-probability/
12. https://byjus.com/maths/tree-diagram/

Pedagogy :

1. Group discussions on how to analyze data , which are the kinds of data, how to represent data?
2. By creating powerpoint presentations and videos for collection and representation of data.
3. Visualization of graphs and exploration of data for example to visually understand least squares regression and the effect of outliers done by using Software "R".
4. Written and oral presentations based on Probability and operations on Probability, Parametric and non-parametric tests used for Sampling.
5. Projects, either group or individual based on data analysis or for recommendation system for marketing purpose

Course Code : CS23104MN	Soft Skills Development (Credits : 2 Lectures/Week: 50 min each)	

Learning Objectives :
- To help learners develop their soft skills and develop their personality together with their technical skills.
- Developing professional, social and academic skills to harness hidden strengths, capabilities and knowledge equip them to excel in real work environments and corporate life.
- Understand various issues in personal and profession communication and learn to overcome them

Expected Learning Outcomes :
1. To know about various aspects of soft skills and learn ways to develop personality together with their technical skills.
2. Developing professional, social and academic skills to harness hidden strengths, capabilities and knowledge equip them to excel in real work environments and corporate life.
3. Understand the importance and type of communication in personal and professional environments.
4. To provide insight into much needed technical and non-technical qualities in career planning.
5. Learn about Leadership, team building, decision making and stress management

Unit I	**Introduction to Soft Skills and Hard Skills** **Personality Development:** Knowing Yourself, Positive Thinking, Johari's Window, Communication Skills, Non-verbal Communication, Physical Fitness. **Emotional Intelligence:** Meaning and Definition, Need for Emotional Intelligence, Intelligence Quotient versus Emotional Intelligence Quotient, Skills to Develop Emotional Intelligence **Etiquette and Mannerism:** Introduction, Professional Etiquette, Technology Etiquette Communication Today: Significance of Communication, GSC's 3M Model of Communication, Virtues of Listening, Fundamentals of Good Listening, Need for Intercultural, Communication, Communicating Digital World.	10 L
Unit II	**Academic Skills :** **Employment Communication:** Introduction, Resume, Curriculum Vitae, Scannable Resume, Developing an Impressive Resume, Formats ofResume, Job Application or Cover Letter **Professional Presentation:** Nature of Oral Presentation, Planning aPresentation, Preparing the Presentation, Delivering the Presentation **Job Interviews:** Introduction, Importance of Resume, Definition of Interview, Background Information, Types of Interviews, Preparatory Steps for Job Interviews, Interview Skill Tips, Changes in the Interview Process, FAQ During Interviews **Group Discussion:** Introduction, Ambience/Seating Arrangement forGroup Discussion, Importance of Group Discussions, Difference between Group Discussion, Panel Discussion and Debate, Traits, Types of Group Discussions, topic based and Case based Group Discussion, IndividualTraits **Practical Assignment :** Developing own resume, MOCK interview session,	10 L

	Conduction of GD	
Unit III	**Professional Skills :** **Creativity at Workplace:** Introduction, Current Workplaces, Creativity, Motivation, Nurturing Hobbies at Work, The Six Thinking Hat Method **Ethical Values:** Ethics and Society, Theories of Ethics, Correlation between Values and Behavior, Nurturing Ethics, Importance of Work Ethics, Problems in the Absence of Work Ethics **Leadership and Team Building:** Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership Styles and Trends, Team Building, Types of Teams **Decision Making and Negotiation:** Introduction to Decision Making, Steps for Decision Making, Decision Making Techniques, Negotiation Fundamentals, Negotiation Styles, Major Negotiation Concepts **Stress and Time Management:** Stress, Sources of Stress, Ways to Cope with Stress **Practical Assignment :** Presentations on Problems in the Absence of Work Ethics, Sources of Stress	**10 L**

Text book:

1. Soft Skills: An Integrated Approach to Maximize Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India

Additional References:

1. Personality Development and Soft Skills, Barun K. Mitra, Oxford Press
2. Business Communication, ShaliniKalia, Shailja Agrawal, Wiley India
3. Soft Skills - Enhancing Employability, M. S. Rao, I. K. International
4. Cornerstone: Developing Soft Skills, Sherfield, Pearson India

ICT References :

1. https://thriveglobal.com/stories/7-reasons-why-you-need-to-learn-about-personality-development/
2. https://www.urbanpro.com/personality-development/top-10-personality-development-tips
3. https://www.slideshare.net/angelinekanodia/johari-window-ppt-new
4. https://www.slideshare.net/sanchita1410/emotional-intelligence-24288292
5. https://www.youtube.com/watch?v=44QeZUIol0I

Pedagogy :

1. By conducting Seminars, Live mock drills, Competitions,showing Online Videos etc. we can teach students Personality Development, Etiquette and Mannerism, Job Interviews, Group Discussion & Leadership and Team Building, Stress Management
2. We can provide Experts live interaction, Knowing industry practices.
3. Other topics can explain well with PPT

Course Code: CS23105OE	Discrete Mathematics (Credits : 2 Lectures/Week: 50 min. each)	

Learning Objectives :

- The purpose of the course is to familiarize the prospective learners with mathematical structures that are fundamentally discrete.
- This course introduces sets and functions, forming and solving recurrence relations and different counting principles.
- These concepts are useful to study or describe objects or problems in computer algorithms and programming languages.

Expected Learning Outcomes :

1. To provide an overview of the theory of discrete objects, starting with relations and partially ordered sets.
2. Study about recurrence relations, generating function and operations on them.
3. Give an understanding of graphs and trees, which are widely used in software.
4. Provide basic knowledge about models of automata theory and the corresponding formal languages.

Unit I	**Recurrence Relations :** **Functions**: Definition of function. Domain, co domain and the range of a function. Direct and inverse images. Injective, surjective and bijective functions. Composite and inverse functions. **Relations**: Definition and examples. Properties of relations , Partial Ordering sets, Linear Ordering Hasse Diagrams , Maximum and Minimum elements, Lattices **Recurrence Relations**: **Definition of recurrence relations :** Formulating recurrence relations, Solving recurrence relations - Backtracking method, Linear homogeneous recurrence relations with constant coefficients, Solving linear homogeneous recurrence relations with constant coefficients of degree two when characteristic equation has distinct roots and only one root, Particular solutions of non linear homogeneous recurrence relation. Solution of recurrence relation by the method of generation functions, Applications-Formulate and solve recurrence relation for Fibonacci numbers, Tower of Hanoi, Intersection of lines in a plane, Sorting Algorithms.	**10 L**
Unit II	**Counting Principles , Languages and Finite State Machine :** Permutations and **Combinations :** Partition and Distribution of objects, Permutation with distinct and indistinct objects, Binomial numbers, Combination with identities: Pascal Identity, Vandermonde's Identity, Pascal triangle, Binomial theorem, Combination with indistinct objects. **Counting Principles :** Sum and Product Rules, Two-way counting, Tree diagram for solving counting problems, Pigeonhole Principle (without proof); Simple examples, Inclusion Exclusion Principle (Sieve formula) (Without proof). **Languages, Grammars and Machines :** Languages , regular Expression and Regular languages, Finite state Automata, grammars, Finite state machines, Gödel numbers.	**10 L**

Unit III	**Graphs and Trees :** **Graphs** : Definition and elementary results, Adjacency matrix, path matrix, Representing relations using digraphs, Warshall's algorithm- shortest path , Linked representation of a graph, Operations on graph with algorithms – searching in a graph; Insertion in a graph, Deleting from a graph, Traversing a graph- Breadth-First search and Depth-First search. Database applications of BST. **Trees :** Definition and elementary results. Ordered rooted tree, Binary trees, Complete and extended binary trees, representing binary trees in memory, traversing binary trees, binary search tree, Algorithms for searching and inserting in binary search trees, Algorithms for deleting in a binary search tree.	**10 L**

Textbook:

1.Discrete Mathematics and Its Applications, Seventh Edition by Kenneth H. Rosen, McGraw Hill Education (India) Private Limited. (2011)
2.Norman L. Biggs, Discrete Mathematics, Revised Edition, Clarendon Press, Oxford 1989.
3.Data Structures Seymour Lipschutz, Schaum's out lines, McGraw- Hill Inc.

Additional References:

1. Elements of Discrete Mathematics: C.L. Liu , Tata McGraw- Hill Edition .
2.Concrete Mathematics (Foundation for Computer Science): Graham, Knuth, Patashnik Second Edition,Pearson Education.
3.Discrete Mathematics: SemyourLipschutz, Marc Lipson, Schaum's out lines, McGraw- Hill Inc.
4.Foundations in Discrete Mathematics: K.D. Joshi, New Age Publication, New Delhi.

ICT Ref.:

1. https://math.libretexts.org/Bookshelves/Combinatorics_and_Discrete_Mathematics/Book%3A_A_Spiral_Workbook_for_Discrete_Mathematics_(Kwong)/07%3A_Relations/7.02%3A_Properties_of_Relations
2. https://www.cs.cmu.edu/~cburch/survey/recurse/hanoitime.html
3. https://www.youtube.com/watch?v=giPQtI7oSKc
4. https://www.britannica.com/science/permutation
5. https://www.youtube.com/watch?v=bvE2-dwNbCA
6. https://www.youtube.com/watch?v=AVVdiInFbEE
7. https://www.tutorialspoint.com/graphs-and-its-traversal-algorithms
8. https://www.tutorialspoint.com/data_structures_algorithms/binary_search_tree.htm

Pedagogy:

1. Traditional teaching can be associated with presentations
2. To check their understanding assignments can be taken for debugging & output tracing.

Course Code: AF23105OE	Direct Tax -I (Credits : 2 Lectures/Week: 3)	
Unit I	**Introduction to Income tax and Basis of Charge 06** Definitions u/s – 2: Assessee, Assessment Year, Assessment, Annual value, Business, Capital asset, Income, Person, Previous Year, Transfer Basis of Charge: Section 3 – 9 – Previous Year, Residential Status, Scope Of Total Income, Deemed Income	**10L**
Unit II	**Heads of Income & Deductions - I 12** Salary Income: Section 15 – 17, Including Section 10 relating to House Rent Allowance, Travel Concession, Special Allowance, Gratuity, Pension – Commutation, Leave Encashment, Compensation, Voluntary Retirement, Payment from Provident Fund Income From House Property: Section 22 – 27, Including Section 2 – Annual Value Profits & Gains From Business & Profession : Vocation Section 28-32, 36, 37, 40, 40A, 43B, 44AD, 44ADA & 44AE including.: Section 2 – Business	**10L**
Unit III	**Heads of Income & Deductions - II 12** Capital Gains : Section 45, 48, 49, 50, 54 and 55 Income from Other Sources: Section 56 – 59 Deductions 80 A 80 C 80CCC 80CCD 80D 80 DD 80DDB 80E 80EE 80G 80 TTA 80TTB 80U Clubbing of Income Section 60 to 65 Set Off & Carry Forward of Losses Sec: 70 Sec: 71 Sec: 71B Sec: 72 Sec: 73 Sec: 74	**10L**

Course Code : CS23108IK	Cyber Law in India (Credits : 2 Lectures/Week: 50 min each)	
Learning Objectives: • To Enable Learner To Understand, Explore, And Acquire A Critical Understanding Cyber Law. • Develop Competencies For Dealing With Frauds And Deceptions Via The Internet. **Expected Learning Outcomes:** 1. Make Learner Conversant With The Social And Intellectual Property Issues Emerging From 'Cyberspace. 2. Explore The Legal And Policy Developments In Various Countries To Regulate Cyberspace; 3. Develop The Understanding Of Relationship Between Commerce And Cyberspace; 4. Give Learners a Knowledge Of Information Technology Act And Legal Frame Work Of Right To Privacy, Data Security And Data Protection. 5. Make Study On Various Case Studies On Real Time Crimes.		
Unit I	**Basic Concepts of Technology Law :** Understanding the Technology of Internet, Scope of Cyber Laws, Cyber Jurisprudence Law of Digital Contracts : The Essence of Digital Contracts, The System of Digital Signature, The Role & Function of Certifying Authorities, The Science of Cryptography Intellectual Property. **Issues in Cyber Space :** Domain Names & Related issues, Copyright in the Digital Media, Patents in the Cyber World. **Computer & Cyber Security:** 1. Types of Attacks, 2. Network Security 3. Overview of Security threats, 4. Hacking Techniques, 5. Password cracking 6. Insecure Network connections, 7. Malicious code 8. Concept of Fire wall Security 9. Email security: web authentication, SSL and SET 10. Database Security 11. Operating System Security 12. E – commerce & M – commerce System Security **Rights of Netizens & E-Governance :** Privacy & Freedom, Issues in the Cyber World, E-Governance, Cyber Crimes & Cyber Laws.	**10 L** **10 L**
	Cyber Crimes & Security: **1**. **Cyber Forensic and Computer Crimes and types. Crimes targeting Computers:** Definition of Cyber Crime & Computer related Crimes, Classification & Differentiation between traditional crime and cyber crimes. 1. Data Theft 2. Hacking 3. Spreading Virus & Worms 4. Phishing 5. Cyber Stalking / Bullying 6. Identity Theft & Impersonation	

Unit II	7. Credit card & Online Banking Frauds
	8. Obscenity, Pornography & Child Pornography
	9. Cyber Defamation, Defacement,
	10. Illegal online selling & Gambling
	11. Denial of Service Attacks
	12. Cyber terrorism
	13. Software Piracy & illegal downloading
	2. **Reasons for Cyber Crimes.**
	3. Cyber Criminal Mode and Manner of Committing Cyber Crime
	4. Information Technology Act 2000:
	   a.Evolution of the IT Act, Genesis and Necessity
	   b. Salient features of the IT Act, 2000, various authorities under IT Act and their powers : Penalties & Offences, amendments.
		10 L

Unit III	**Case Study On Cyber Crimes:** 1. Harassment Via EMails, 2. Email 3. Spoofing,, 4. Cyber Pornography (Exm.MMS), 5. Cyber-Stalking 6. & so on	**10 L**

Text book :

1. K.Kumar," Cyber Laws: Intellectual property & E Commerce, Security",1st Edition, Dominant Publisher,2011.
2. Rodney D. Ryder, " Guide To Cyber Laws", Second Edition, Wadhwa And Company, New Delhi, 2007.
3. Information Security policy & implementation Issues, NIIT, PHI.

Additional References :

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley
2. IPR & Cyber Laws by Harsha Deshpande, Sheth Publication.
3. Vakul Sharma, "Handbook Of Cyber Laws" Macmillan India Ltd, 2nd Edition,PHI,2003.
4. Justice Yatindra Singh, " Cyber Laws", Universal Law Publishing, 1st Edition,New Delhi, 2003.
5. Sharma, S.R., "Dimensions Of Cyber Crime", Annual Publications Pvt. Ltd., 1st Edition, 2004.
6. Augustine, Paul T.," Cyber Crimes And Legal Issues", Crescent Publishing Corporation, 2007.

ICT Reference :

1. https://onlinecourses.swayam2.ac.in/cec20_cs15/preview
2. https://www.youtube.com/watch?v=KsLpoKRgF4U&t=463s
3. https://www.youtube.com/watch?v=OYQordD3BlU
4. https://www.youtube.com/watch?v=C4d2Ws2VMQ0

Course Code: CS23109SE	Computer Organization and Design (Credits : 2 Lectures/Week: 50 min. each)	
Learning Objectives : To understand the structure and operation of modern processors and their instruction sets. **Expected Learning Outcomes :** 1) To learn about how computer systems, work and underlying principles 2) To understand computer number systems 2) To understand the basics of digital electronics needed for computers 3) To understand the basics of instruction set architecture for reduced and complex instruction sets 4) To understand the basics of processor structure and operation 5) To understand how data is transferred between the processor and I/O devices		
Unit I	**Computer Abstractions and Technology**: Basic structure and operation of a computer, functional units and their interaction. **Computer Number Systems**: Representation of numbers and characters. Binary, Octal, Hexadecimal conversions & arithmetic's. **Logic circuits and functions**: Combinational circuits and functions, Basic logic gates and functions, truth tables, logic circuits and functions. Minimization with Karnaugh maps. Synthesis of logic functions with. and-or-not gates, nand gates, nor gates. Fan-in and fan-out requirements; tristate buffers. Half adder, full adder, ripple carry adder. (Flip flops) Gated S-R and D latches, edge-triggered D latch. Shift registers and registers. Decoders, multiplexers.	**10 L**
Unit II	**Instruction set architectures:** Memory organization, addressing and operations; word size, big-endian and little endian arrangements. instructions, sequencing. **Instruction sets for RISC and CISC** Examples Altera NIOS II and Freescale Cold Fire). Operand addressing modes: pointers; indexing for arrays. Machine language, assembly language, assembler directives. **Types of machine instructions**: arithmetic, logic, shift, etc. **Instruction sets,** RISC and CISC examples.	**10 L**

Unit III	**Basic Processor Unit:** Main components of a processor: registers and register files, ALU, control unit, instruction fetch unit, Interfaces to instruction and data memories. Datapath. Instruction fetch and execute; Executing arithmetic/logic, memory access and branch instructions. **Basic I/O** : Accessing I/O devices, data transfers between processor and I/O devices. Interrupts and exceptions: interrupt requests and processing. **Introduction to Embedded systems:** Overall concept of embedded system, Need & application	**10 L**

Text books :

1. Carl Hamacher et al., Computer Organization and Embedded Systems, 6 ed., McGraw- Hill 2012

Additional References :

1. Patterson and Hennessy, Computer Organization and Design, Morgan Kaufmann, ARM Edition, 2011
2. R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd. , 4th Edition, 2010

ICT Ref. :

1. https://youtu.be/VTGcansb9zM
2. https://youtu.be/MPMX7TKcGis
3. https://youtu.be/umqLvHYeGiI
4. https://youtu.be/7qPznqr4ndI
5. https://youtu.be/MwBPkoU28kg
6. https://youtu.be/TRCt9OpuHdY
7. https://youtu.be/PDYuYGHT668

Pedagogy :

1. Live demonstration of the computer & its internal hardware can be provided.
2. more practice and problem solving exercises.
3. Traditional teaching method using PPT containing diagrams

Course Code : CS23110VE	Green Technologies - I (Credits : 2 Lectures/Week:50 min. each)	

Learning Objectives :
- To familiarize with the concept of Green Computing and Green IT infrastructure for making computing and information system environments sustainable.
- Encouraging optimized software and hardware designs for development of Green IT Storage, Communication and Services. To highlight useful approaches to embrace green IT initiatives.

Expected Learning Outcomes:
1. Learning about green IT can be achieved in and by hardware, software, network communication and data center operations.
2. Understand the strategies, frameworks, processes and management of green IT.

Unit I	**Introduction of Green IT: Problems:** Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power. **Changing the Way of Work:** Old Behaviors, starting at the Top, Process Reengineering with Green in Mind, Analyzing the Global Impact of Local Actions, Steps: Water, Recycling, Energy, Pollutants, Teleworkers and Outsourcing, Telecommuting, Outsourcing, how to Outsource.	**10 L**
Unit II	**Going Paperless:** Going Paperless: Paper Problems, The Environment, Costs: Paper and Office, Practicality, Storage, Destruction, Going Paperless, Organizational Realities, Changing Over, Paperless Billing, Handheld Computers vs. the Clipboard, Unified Communications, Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange (EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles. **Green Industrial Processes:** Pollution statistics from various industries like polymer, textile, pharmaceutical, dyes, pesticides and wastewater treatment. A greener approach towards all these industries	**10 L**
Unit III	**Green Compliance:** Protocols, Standards, and Audits: Protocols and Standards, ISO 14000-2004 Standard, Various initiatives by stakeholders, Green Audits and types, Audit and use of Carbon emission management software **Introduction to green chemistry and technology:** Twelve principles of green chemistry, Green technology-definition, importance, factors affecting green technology. Role of industry, government and institutions; industrial ecology, role of industrial ecology in green technology	**10 L**

Text book :
1. Green IT, Toby Velte, Anthony Velte Robert Elsenpeter, McGraw Hill.

2. Rashmi Sanghi and M.M. Srivastava, Green Chemistry-Environment Friendly Alternatives, NarosaPublishing House, New Delhi 2009.
3. Paul L. Bishop, Pollution prevention –Fundamentals and Practices, McGraw-Hill- international 2000.
4. Pollution Prevention: Fundamentals and Practice, Bishop P. L. McGraw-Hill, Boston, 2000.
5. Green IT,Deepak Shikarpur ,Vishwakarma Publications

Additional References :
1. Chemistry for Environmental Engineering and Science, Sawyer C.N, McCarty P.L and Parkin G.F. 5 th ed. McGraw-Hill Professional, 2003.
2. Environmental Chemistry with Green Chemistry, Das A. K. Books and Allied (P) Ltd., Kolkata, India, 2012.
3. Green Chemistry: Environmentally Benign Reactions, Ahluwalia, V.K. Ane Books India, New Delhi, India, 2006. Green Chemistry: An Introductory Text, Lancaster M. Royal Society of Chemistry, Cambridge, 2002.

ICT Reference :
1. **https://www.youtube.com/watch?v=GQboNg4Iwqs**
2. **https://www.youtube.com/watch?v=tiz4Rol8tcE**

Pedagogy :
1. Traditional teaching can be associated with some PPT sessions or YouTube videos
2. Assignments can be taken for better understanding.

Semester I
Practical for Major, Minor subjects

Course code : CS23103MM: **Practical list of Programming with Python I**

1. Installing and setting up the Python IDLE interpreter. Executing simple statements like expression statement (numeric and Boolean types), assert, assignment, delete statements; the print function for output.
2. Script and interactive modes; defining a function in the two modes; executing a script; interactively executing a statement list (semicolon-separated sequence of simple statements); the input function.
3. Programs based on lists, conditional constructs, the for statement and the range function; interactively using the built-in functions len, sum,max, min
4. Programs related to string manipulation
5. Programs based on the while statement; importing and executing built-infunctions from the time, math and random modules
6. Programs using break and continue statements.
7. Programs related to dictionaries
8. Programs using list comprehensions and anonymous functions
9. Programs using the built-in methods of the string, list and dictionary classes

Course code :   CS23103MM: **Practical List of Descriptive Statistics and Introduction to Probability**

((To be implemented using R))

1. Frequency distribution and data presentation

2. Measures of central tendency
3. Data entry using, functions, c(), scan (), Creating vectors, MathematicalOperations: ** +/-/*/ / ^ ,exp, log, log10, etc, creating vector of text type, useful functions: data, frame, matrix operations, seq(), split() etc.
4. Frequency distribution using cut(), table()
5. Data presentation
6. Summary Statistics (measures of central tendency, dispersion)
7. Measures of skewness and kurtosis
8. Correlation and regression
9. Probability
10. Conditional probability

Pedagogy :

1. Traditional teaching can be associated with some PPT sessions or YouTube videos
2. Case Studies for Better Understanding.

Course code: CS23106AE: Soft Skill Development
Practical list of Soft Skill Development

1.Creating and formatting a word document.
 2.Preparing a PowerPoint presentation on an E-Commerce website.
 	
 3.Team building has radically evolved as a technique to develop and manage effective teams in the workplace.
 4.Importance of communication skills
  5.Exercises on Communication Principles
  6.Use of word processing tools for communication
  7.Use of spreadsheet tools for communication
  8.Use of presentation tools for communication
  9.Learning Objectives of Soft skills
  10. How to develop Interpersonal Relations like Empathy, Sympathy

Course code: CS23107VS: Computer Organization and Design
Practical list of Computer Organization and Design
1. Study and verify the truth table of various logic gates (NOT, AND, OR, NAND, NOR, EX-OR, andEX-NOR).   2. Simplify given Boolean expression and realize it.   3. Design and verify a half/full adder   4. Design and verify half/full subtractor   5. Design a 1 bit magnitude comparator using combinational circuits.   6. Design and verify the operation of flip-flops using logic gates.   7. Verify the operation of a counter.   8. Verify the operation of a 4 bit shift register.   9. Using SPIM, write and test a machine program that reads two integers, adds them and returns a sum. Using SPIM, write and test a program that reads in a positive integer using the SPIM system calls. If the integer is not positive, the program should terminate with the message "Invalid Entry"; otherwise the program should give a message "Valid entry".

Note :
- **Practical No. 1 to 8 can be performed using any open source simulator (like MultimediaLogic) (Download it from https://sourceforge.net/projects/multimedialogic/files/latest/download)**
- **Practical No. 9 and 10 are required to be done using SPIM. SPIM is a self contained simulator that will run MIPS R2000/R3000 assembly language programs. # Latest version is available at https://sourceforge.net/projects/spimsimulator/**

Course code: CS23107VS: Practical list of Discrete Mathematics
1. Graphs of standard functions such as absolute value function, inverse function, logarithmic and exponential functions, flooring and ceiling functions,trigonometric functions over suitable intervals.   2. Partial ordering sets, Hasse diagram and Lattices.   3. Recurrence relation.   4. Different counting principles.   5. Finite state Automata and Finite state machines.   6. Warshall's Algorithm.   7. Shortest Path algorithms.   8. Operations on graph.   9. Breadth and Depth First search algorithms.   10. Concept of searching, inserting and deleting from binary search trees.   11. Breadth and Depth First search algorithms.   12. Concept of searching, inserting and deleting from binary search trees.

Course Code : CS23201MM	Programming with Python II (Credits : 2 Lectures/Week: 50 min. each)	
Learning Objectives: ● The objective of this course is to provide a comprehensive study of the C programming language, stressing upon the strengths of C, which provide the students with the means of writing modular, efficient, maintainable, and portable code **Expected Learning Outcomes :** 1. Students should be able to write, compile and debug programs in C language. 2. Students should be able to use different data types in a computer program. 3. Students should be able to design programs involving decision structures, loops and functions. 4. Students should be able to explain the difference between call by value and call by reference 5. Students should be able to understand the dynamics of memory by the use of pointers.		
Unit I	**Python File Input-Output :** Opening and closing files, various types of file modes, reading and writing to files,manipulating directories. Iterables, iterators and their problem solving applications. **Exception handling :** What is an exception, various keywords to handle exceptions such try, except, else, finally, raise. **Regular Expressions :** Concept of regular expression, various types of regular expressions, using match function. **OOP :** Features of object oriented programming language, implementing inheritance	10 L
Unit II	**GUI Programming in Python (using Tkinter/wxPython/Qt) :** What is GUI, Advantages of GUI, Introduction to GUI library. Layout management, Widgets such as : frame, label, button, checkbutton, entry, listbox, message, radiobutton, text, spinbox, etc.	10 L
Unit III	**GUI :** events and bindings, fonts, colours, drawing on canvas, line, oval, rectangle, etc. **Database connectivity in Python** : Installing mysql connector, accessing connector module module, using connect, cursor, execute & close functions, reading single & multiple results of query execution, executing different types of statements, executing transactions, understanding exceptions in database connectivity.	10 L

Text books :
1. Paul Gries , Jennifer Campbell, Jason Montojo, Practical Programming: An Introduction to Computer Science Using Python 3, Pragmatic Bookshelf, 2/E 2014

Additional References :
1. James Payne , Beginning Python: Using Python 2.6 and Python 3, Wiley India, 2010

2. A. Lukaszewski, MySQL for Python: Database Access Made Easy, Pact Publisher, 2010

ICT Ref. :
1. https://www.tutorialspoint.com/python/python_reg_expressions.htm
2. https://opensource.com/resources/python/gui-frameworks
3. https://www.youtube.com/watch?v=g60QghtJmjY

Pedagogy :

1. Traditional teaching can be associated with presentations
2. Projected demo with hands-on will make concept more clear
3. To check their understanding assignments can be taken for debugging & output tracing

Course Code : CS23202MM	Statistical Methods and Testing of Hypothesis (Credits : 2 Lectures/Week:50 min. each)	
Learning Objectives: ● The purpose of this course is to familiarize students with basics of Statistics. This will be essential for prospective researchers and professionals to know these basics. **Expected Learning Outcomes :** 1. Enable learners to know descriptive statistical concepts 2. Enable study of probability concept required for Computer learners 3. Learner's will get an idea about proper selection of variation tests		
Unit I	**Standard distributions** : random variable; discrete, continuous, expectation and variance of a random variable, pmf, pdf, cdf, reliability. **Introduction and properties :** without proof for following distributions: binomial, normal,chi-square, t, F.	10 L
Unit II	**Hypothesis testing** : one sided, two sided hypothesis, critical region, p-value, confidence intervals. **Student's t distribution, normal distribution, F distribution, chi- square distribution** **Analysis of variance** : one-way, two-way analysis of variance	10 L
Unit III	**Difference between parametric and non-parametric test : Non-parametric tests :** need of non-parametric tests, sign test, Wilicoxon's signed rank test, run test, Kruskal-Walis tests. **Post-hoc analysis** of one-way analysis of variance : Duncan's test Chi- square test of association	10 L

Text Book :

1. Trivedi, K.S.(2009) : Probability, Statistics, Design of Experiments and Queuing theory, with applications of Computer Science, Prentice Hall of India, New Delhi

Additional References :

1. Ross, S.M. (2006): A First course in probability. 6th Ed^n Pearson

2. Kulkarni, M.B., Ghatpande, S.B. and Gore, S.D. (1999): Common statistical tests. SatyajeetPrakashan, Pune
3. Gupta, S.C. and Kapoor, V.K. (2002) : Fundamentals of Mathematical Statistics,S. Chand and Sons, New Delhi
4. Gupta, S.C. and Kapoor, V.K. (4th Edition) : Applied Statistics, S. Chand and Son's, New Delhi
5. Montgomery, D.C. (2001): Planning and Analysis of Experiments, Wiley.

ICT Ref. :

1. https://www.youtube.com/watch?v=CfZa1daLjwo
2. https://www.youtube.com/watch?v=vqojqDds_eo
3. https://www.youtube.com/watch?v=3PWKQiLK41M
4. https://www.youtube.com/watch?v=Q1yu6TQZ79w
5. https://www.youtube.com/watch?v=2tuBREK_mgE
6. https://www.youtube.com/watch?v=gHBL5Zau3NE
7. https://www.youtube.com/watch?v=h5Glm738j84https://www.youtube.com/watch?v=xLYgEUAOyTQ
8. https://www.youtube.com/watch?v=z6qZK5w3Zxc
9. https://keydifferences.com/difference-between-parametric-and-nonparametric-test.html
10. https://www.youtube.com/watch?v=OypCNBPmGBY

Pedagogy:

1. Group discussions on how to analyze data , which are the kinds of data, how to represent data
2. By creating power point presentations and videos for collection and representation of data.
3. Visualization of graphs and exploration of data for example to visually understand least squares regression and the effect of outliers done by using Software "R".
4. Written and oral presentations based on Probability and operations on Probability, Parametric and non-parametric test used for Sampling.
5. Projects, either group or individual based on data analysis or for a recommendation system for marketing purpose.

Course code : CS23204MN	Data Structures (Credits : 2Lectures/Week: 50 min. each)	
Objectives. ● To explore and understand the concepts of Data Structures and its significance in programming. Provide and holistic approach to design, use and implement abstract data types. ● Understand the commonly used data structures and various forms of its implementation for different applications using Python. **Expected Learning Outcomes:** 1. Learn about Data structures, its types and significance in computing 2. Explore about Abstract Data types and its implementation 3. Ability to program various applications using different data structure in Python.		
Unit I	**Abstract Data Types :** Introduction, The Date Abstract Data Type, Bags, Iterators. Application **Arrays :** Array Structure, Python List, Two Dimensional Arrays, Matrix Abstract Data Type, Application **Sets and Maps :** Sets-Set ADT, Selecting Data Structure, List based Implementation, Maps-Map ADT, List Based Implementation, Multi-Dimensional Arrays-Multi-Array ADT, Implementing Multiarrays, Application. **Algorithm Analysis :** Introduction, Finding complexity of algorithm: time and space. **Searching and Sorting :** Searching-Linear Search, Binary Search, Sorting-Bubble, Selection and Insertion Sort, Working with Sorted Lists-Maintaining Sorted List, Maintaining sorted Lists.	**10 L**
Unit II	**Linked Structures** : Introduction, Singly Linked List-Traversing, Searching, Prepending and Removing Nodes, Bag ADT-Linked List Implementation. Comparing Implementations, Linked List Iterators, More Ways to Build linked Lists, Applications-Polynomials **Stacks** : Stack ADT, Implementing Stacks-Using Python List, Using Linked List, StackApplications-Balanced Delimiters, Evaluating Postfix Expressions **Queues** : Queue ADT, Implementing Queue-Using Python List, Circular Array, Using List, Priority Queues- Priority Queue ADT, Bounded and unbounded Priority Queues **Advanced Linked List** : Doubly Linked Lists-Organization and Operation, Circular Linked List-Organization and Operation, Multi Lists	**10 L**
Unit III	**Recursion :** Recursive Functions, Properties of Recursion, Its working, Recursive Applications **Hash Table :** Introduction, Hashing-Linear Probing, Clustering, Rehashing, Separate Chaining, Hash Functions **Advanced Sorting :** Merge Sort, Quick Sort, Sorting Linked List **Binary Trees :** Tree Structure, Binary Tree-Properties, Implementation and Traversals, Expression Trees, Heaps and Heapsort, Search Trees	**10 L**

Text book :

1. Data Structure and algorithm Using Python, Rance D. Necaise, 2016 Wiley India Edition
2. Data Structure and Algorithm in Python, Michael T. Goodrich, RobertomTamassia, M. H. Goldwasser, 2016 Wiley India Edition

Additional References:

1. Data Structure and Algorithmic Thinking with Python- NarasimhaKarumanchi, 2015, Careermonk Publications
2. Fundamentals of Python: Data Structures, Kenneth Lambert, Delmar Cengage Learning

ICT Ref. :

1. https://www.youtube.com/watch?v=m9n2f9lhtrw
2. https://www.youtube.com/watch?v=qp8u-frRAnU
3. https://www.youtube.com/watch?v=f5dU3xoE6ms

Pedagogy :

1. Traditional teaching can be associated with presentations
2. Projected demo with hands-on will make concept more clear
3. To check their understanding assignments can be taken for debugging & output tracing

Course Code: CS23205OE	Calculus (Credits : Lectures/Week: 50 min. each)	

Learning Objectives :
- The course is designed to have a grasp of important concepts of Calculus in a scientific way.
- It covers topics from as basic as definition of functions to partial derivatives of functions in a gradual and logical way.
- The learner is expected to solve as many examples as possible to a get compete clarity and understanding of the topics covered.

Expected Learning Outcomes :

1. Understanding of Mathematical concepts like limit, continuity, derivative, integration of functions.
2. Ability to appreciate real world applications which uses these concepts.
3. Skill to formulate a problem through Mathematical modeling and simulation.

Unit I	**DERIVATIVES AND ITS APPLICATIONS :** Review of Functions, limit of a function, continuity of a function, derivative function. Derivative In Graphing And Applications: Analysis of Functions: Increase, Decrease, Concavity, RelativeExtrema; Graphing Polynomials, Rational Functions, Vertical Tangents. Absolute Maxima and Minima, Applied Maximum and Minimum Problems, Newton's Method.	**10 L**
Unit II	**INTEGRATION AND ITS APPLICATIONS :** An Overview of the Area Problem,Indefinite Integral, Definition of Area as a Limit; Sigma Notation, Definite Integral, Evaluating Definite Integrals by Substitution, Area Between Two Curves, Length of a Plane Curve. Numerical Integration: Simpson's Rule. Modeling with Differential Equations, Separation of Variables, Slope Fields, Euler's Method, First- Order Differential Equations and Applications.	**10 L**
Unit III	**PARTIAL DERIVATIVES AND ITS APPLICATIONS :** Functions of Two or More Variables Limits and Continuity Partial Derivatives, Differentiability, Chain Rule, Directional Derivatives and Gradients, Tangent Planes and Normal, Vectors, Maxima and Minima of Functions of Two Variables.	**10 L**

Textbook :

1. Calculus: Early transcendental (10th Edition): Howard Anton, IrlBivens, Stephen Davis, John Wiley & sons, 2012.

Additional References :

1. Calculus and analytic geometry (9th edition): George B Thomas, Ross L Finney, Addison Wesley, 1995
2. Calculus: Early Transcendentals (8th Edition): James Stewart, Brooks Cole, 2015.
3. Calculus (10th Edition): Ron Larson, Bruce H. Edwards, Cengage Learning, 2013.
4. Thomas' Calculus (13th Edition): George B. Thomas, Maurice D. Weir, Joel R. Hass, Pearson, 2014.

ICT Ref.:

1. https://brilliant.org/wiki/extrema/
2. https://byjus.com/maths/applications-of-derivatives/
3. https://innertowords.com/application-of-derivatives-in-economics-and-commerce/

Pedagogy :

1. Traditional teaching can be associated with presentations
2. Projected demo with hands-on will make concept more clear
3. To check their understanding assignments can be taken for debugging & output tracing

Cours Code: AF23205OE	Direct Tax -II (Credits : 2 Lectures/Week: 50 min. each)	
Unit I	**Tax rates of Individual 10** Slab rates as per new and old tax regime, partial integration, special rates, rebate, surcharge, H&E cess	10 L
Unit II	**Return of Income & Assessments 10** Sec 139 Excluding u/s 139(4A), 139(4B), 139(4C) & 139 (4D) Summary assessment Sec 143(1), Scrutiny assessment Sec. 143(3), Best Budget Assessment Sec. 144, Faceless Assessment Sec. 144B, Income Escaping Assessment Sec. 147 & 148A, Faceless Assessment of income escaping assessment Sec. 151A	10 L
Unit III	**Tax Deduction at Source Advance Tax, Interest Payable 10** Deduction of Taxes at Source Sec: 192 Sec: 194A Sec: 194C Sec: 194H Sec: 194I Sec: 194J Advance Tax U/S 207, 208, 209, 210 & 211 Interest Payable U/S 234A, 234B, 234C	10 L

Course code: CS23208SE	Linux (Credits : 2 Lectures/Week: 50 min. each)	

Learning Objectives.

● To understand the structure and operation of modern processors and their instruction sets

Expected Learning Outcomes:

1. To learn about how computer systems work and underlying principles
2. To understand the basics of digital electronics needed for computers
3. To understand the basics of instruction set architecture for reduced and complex instruction sets
4. To understand the basics of processor structure and operation.
5. To understand how data is transferred between the processor and I/O devices

Unit I	**Introduction :** History of Linux, Philosophy, Community, Terminology, Distributions, Linux kernel vs distribution. Why learn Linux? Importance of Linux in software ecosystem: web servers, supercomputers, mobile, servers. **Installation :** Installation methods, Hands on Installation using CD/DVD or USB drive. **Linux Structure :** Linux Architecture,, Filesystem basics, The boot process, init scripts, runlevels, shutdown process, Very basic introductions to Linux processes, Packaging methods:rpm/deb, Graphical Vs Command line.	10 L
Unit II	**Graphical Desktop :** Basic Desktop Operations, Installing and Updating Software, Text editors: gedit, vi, vim, emacs, Graphics editors,Multimedia applications. **Command Lin**e : Command line mode options, Shells, Basic Commands, General Purpose Utilities, Installing Software, User management, Environment variables, Command aliases. **Linux Documentation :** man pages, GNU info, help command, More documentation sources **File Operations :** Filesystem, Filesystem architecture, File types, File attributes, Working with files, Backup, compression	10 L
Unit III	**Security :** Understanding Linux Security, Uses of root, sudo command, working with passwords, Bypassing user authentication, Understanding ssh **Networking :** Basic introduction to Networking, Network protocols : http, ftp etc., IP address, DNS, Browsers, Transferring files, ssh, telnet, ping, traceroute, route, hostname, networking GUI. **Basic Shell Scripting :** Features and capabilities, Syntax, Constructs, Modifying files, Sed, awk command, Scripting File manipulation utilities, Dealing with large files and Text, String manipulation, Boolean expressions, File tests, Case, Debugging, Regular expressions	10 L

Text book :

1. Unix Concepts and Applications by Sumitabha Das.
2. Official Ubuntu Book, 8th Edition, by Matthew Helmke& Elizabeth K. Joseph with Jose Antonio Rey and Philips Ballew, Prentice Hall

Additional References:

1. Linux kernel Home: http://kernel.org
2. Open Source Initiative: https://opensource.org/
3. The Linux Foundation: http://www.linuxfoundation.org/

ICT Ref. :

1. https://youtu.be/oEDItVVDZqE
2. https://youtu.be/Dx2dJUPsJ
3. https://www.thegeekstuff.com/2010/09/linux-file-system-structure/
4. https://www.computerhope.com/unix/sudo.htm

5. https://www.geeksforgeeks.org/

Pedagogy:

- Linux distributions can be better taught by installing more than one type of them by guiding students.
- Various modes of installations can be taught to the students that is either by using usb/network.
- Network management tools can also be demonstrated in the practical slots

Course code : CS23210VE	Green Technologies-II (Credits : 2 Lectures/Week :50 min. each)	
Learning Objectives :		

Learning Objectives :

- To familiarize with the concept of Green Computing and Green IT infrastructure for making computing and information system environment sustainable.
- Encouraging optimized software and hardware designs for development of Green IT Storage, Communication and Services. To highlight useful approaches to embrace green IT initiatives.

Expected Learning Outcomes :

1. Learn about green IT can be achieved in and by hardware, software, network communication and data center operations.
2. Understand the strategies, frameworks, processes and management of green IT

Unit I	**Green IT Overview**: Environmental Concerns and Sustainable Development, Environmental Impacts of IT ,Holistic Approach to Greening IT, Greening IT,. Applying IT for Enhancing Environmental Sustainability, Green IT Standards and Eco-Labelling of IT, Green Washing, Green IT: Burden or Opportunity. **Green Devices and Hardware**: Introduction, Life Cycle of a Device or Hardware, Reuse, Recycle and Dispose **Green Software**: Introduction, Processor Power States, Energy-Saving Software Techniques, Evaluating and Measuring Software Impact to Platform Power	**10 L**
Unit II	**Green Data Centres**: Data Centres and Associated Energy Challenges, Data Centre IT Infrastructure, Data Centre Facility Infrastructure: Implications for Energy Efficiency, IT Infrastructure Management, Green Data Centre Metrics **Green Data Storage:** Introduction, Storage Media Power Characteristics, Energy Management Techniques for Hard Disks, System-Level Energy Management **Green Networks and Communications**: Introduction, Objectives of Green Network Protocols, Green Network Protocols and Standards Enterprise.	**10 L**

Unit III	**Enterprise Green IT Readiness**: Introduction, Readiness and Capability, Development of the G-Readiness Framework, Measuring an Organization's G-Readiness **Sustainable IT Services**: Creating a Framework for Service Innovation: Introduction, Factors Driving the Development of Sustainable IT, Sustainable IT Services (SITS), SITS Strategic Framework **Green Enterprises and the Role of IT:** Introduction, Organizational and Enterprise Greening, Information Systems in Greening Enterprises, Greening the Enterprise: IT Usage and Hardware, Inter-organizational Enterprise Activities and Green Issues.	10 L

Text book :
1. Harnessing Green IT: Principles and Practices, San Murugesan, G. R. Ganadharan, Wiley & IEEE.

Additional References :
1. Green IT, Deepak Shikarpur, Vishwkarma Publications, 2014.
2. Green Communications: Principles, Concepts and Practice- Samdanis et al, J. Wiley

ICT References :
1. https://www.slideshare.net/sc09b093/it-effects-on-environment
2. https://www.computerweekly.com/blog/Green-Tech/8-ways-to-make-your-software-applications-more-energy-efficient
3. https://www.slideshare.net/IGBCGreenBuildingCon/presentation-on-green-data-centres
4. https://goodtipsntricks.blogspot.com/2015/08/energy-management-techniques-for-hard.html
5. https://www.slideshare.net/ranjanagore/enterprise-green-it-strategy
6. https://www.youtube.com/watch?v=2f5m-jBf81Q

Pedagogy :
1. *PPT, Online videos*
2. Industry Visits, Industry Expert officials interaction, Live Demos

Semester II

Practical list for Major, Minor subject

Course code: CS23203MM   Practical list for Programming with Python II

1. Programs to read and write files.
2. Programs with iterables and iterators.
3. Program to demonstrate exception handling.
4. Program to demonstrate the use of regular expressions.
5. Program to show draw shapes & GUI controls.
6. Program to create server-client and exchange basic information.
7. Program to send email & read contents of URL.

Course code: CS23203MM   Practical list Statistical Methods and Testing of Hypothesis

1. Problems based on binomial distribution
2. Problems based on normal distribution
3. Property plotting of binomial distribution
4. Property plotting of normal distribution
5. Plotting pdf, cdf, pmf, for discrete and continuous distribution
6. t test, normal test, F test
7. Analysis of Variance
8. Non parametric tests- I
9. Non- Parametric tests – II Post-hoc analysis of one-way analysis

Course code: CS23206 AE: Green Technologies-II

Practical list for Green Technologies-II

1 Familiarization with renewable energy gadgets
2. To study about Battery Free FlashLight
3. To study gasifier
4. To study all about Green Building
5. To study briquetting machine
6. To study about Traffic Wind Turbine
7.Familiarization with different solar energy gadgets
8. Green Roof Technology
9. To study about solar lighting
10. To study and Built a project onEco Cooler

Practical list for Data Structure and Linux

Course code: CS23207VS: Data structures

1. Implement Linear Search to find an item in a list.
2. Implement binary search to find an item in an ordered list.
3. Implement Sorting Algorithms
   a) Bubble sort
   b) Insertion sort
   c) Quick sort
   d) Merge Sort
4. Implement use of Sets and various operations on Sets.
5. Implement working of Stacks. (pop method to take the last item added off the stack and a push method to add an item to the stack)
6. Implement Program for
   a) Infix to Postfix conversion
   b) Postfix Evaluation
7. Implement the following
   a) A queue as a list which you add and delete items from.
   b) A circular queue. (The beginning items of the queue can be reused).
8. Implement Linked list and demonstrate the functionality to add and delete items in the Linked list.
9. Implement Binary Tree and its traversals. Recursive implementation of
   a. Factorial
   b. Fibonacci
   c. Tower of Hanoi

Course code: CS23207VS: Linux

1. Linux Installation :
   a. Install your choice of Linux distribution e.g. Ubuntu, Fedora, Debian.
   b. Try different installation media like CD/DVD, USB Drive to install.
   c. Customize desktop environment by changing different default options
      like changing default background, themes, screensavers.

2.
   a. **Screen Resolution**: Ascertain the current screen resolution for your desktop.
   b. **Networking:** Get the current networking configuration for your desktop.
      Are you on a wired or a wireless connection? What wireless networks are available, if any?
   c. **Time Settings** Change the time zone of your system to (or New York Time if you are currently in Indian time). How does the displayed time change?After noting the time change, change the time zone back to your local time zone.

3. **Installing and Removing Software:**
   a**. Install gcc package**. Verify that it runs, and then remove it.

4. **Documentations:**
   a. Finding Info Documentation: From the command line: bring up the info page for the grep

command. Bring up the usage section.
  b. Finding man pages From the command line: Bring up the man page for the 'ls' command. Scroll down to the EXAMPLES section.
  c. Finding man pages by Topic What man pages are available that document file compression?
  d. Finding man pages by Section From the command line, bring up the man page for the printf library function. Which manual page section are library functions found?
  e. Command-Line Help List the available options for the mkdir command. How can you do this?

5. Command line operations:
  a. Install any new package on your system
  b. Remove the package installed
  c. Find the passwd file in / using find command
  d. Create a symbolic link to the file you found in last step
  e. Create an empty file example.txt and move it in /tmp directory using relative pathname.
  f. Delete the file moved to /tmp in the previous step using absolute path.
  g. Find the location of ls, ps, bash commands.

6. File Operations:
  a. Explore mounted filesystems on your system.
  b. What are different ways of exploring mounted file systems on Linux?
  c. Archive and backup your home directory or work directory using tar, gzip commands.
  d. Use dd command to create files and explore different options to dd.
  e. Use diff command to create diff of two files.
  f. Use patch command to patch a file. And analyze the patch using diff command again.

7. Use environment
  a. Which account are you logged in? How do you find out?
  b. Display /etc/shadow file using cat and understand the importance of shadow file. How it's different than passwd file.
  c. Get you current working directory.
  d. Explore different ways of getting command history, how to run previously executed commands without typing it?
  e. Create aliases to most commonly used commands like.

8. Linux Editors: vim/emacs
  a. Create,modify, search, navigate a file in editor.
  b. Learn all essential commands like search, search/replace, highlight, show line numbers.

9. Linux Security:
  a. Use of sudo to change user privileges to root
  b. Identify all operations that require sudo privileges
  c. Create a new user and add it to the sudo configuration file.
  d. Set password for new user.
  e. Modify the expiration date for new users using password ageing.
  f. Delete newly added users.

10. Network:
  a. Get the IP address of your machine using ifconfig.
  b. If IP is not set, then assign an IP address according to your network settings.
  c. Get the hostname of your machine.
  d. Use ping to check the network connectivity to remote machines.

e. Use telnet/ssh to connect to remote machines and learn the difference between the two.
f. **Troubleshooting network using traceroute, ping, route commands.**

11. Shell Scripting
a. Searching with grep: Search for your username in the /etc/passwd file.
b. Parsing files with awk: Display in a column a unique list of all the shells used for users in /etc/passwd. Which field in /etc/passwd holds the shell (user command interpreter in the manual page)? How do you make a list of unique entries, that is, no repeated entries?
c. Searching and substituting with sed: Search all instances of the user command interpreter (shell) equal to /bin/false in /etc/passwd and substitute with /bin/bash using sed.
d. Exit status: write a script which does ls to a non existent file. Display an exit status of the previous command. Now create the file and again display the exit status. In each task send the ls output to /dev/null
e. Working with files: Write a shell script which will ask the user for a directory, create that directory and switch to it and tell the user where you are using the pwd command. Now use touch to create some new files followed by displaying the filenames.
f. Environment variables: Write a script which displays all environment variables on the system.
g. Functions: Write a script that asks the user for a number (1,2 or 3) which is used to call a function with the number in its name. The function then displays a message with the function number within it, example: "This message is from function number 4."
h. Arithmetic: Write a script which will work as an arithmetic calculator to add, subtract, multiply, divide. The user should pass an argument on the command line a letter (a,s,m or d) and two numbers. If the wrong number of arguments are passed then display an error message. Make use of functions to perform operations.
i. Case Statements: Write a script that will be given a month number as the argument and will translate this number into a month name. The result will be printed to stdout.
j. Script Arguments and Usage Information: Write a script that takes exactly one argument, a directory name. The script should print that argument back to standard output. Make sure the script generates a usage message if needed and that it handles errors with a message.
k. Randomness: Create a script that takes a word as an argument from the user, then appends a random number to the word and displays it to the user. Put in a check to make sure the user passed in a word, displaying a usage statement if a word was not passed as an argument.
l. Strings: Write a script that will read two strings from the user. The script will perform three operations on the two strings:
    i. Use the test command to see if one of the strings is of zero length and if the other is of non-zero length, telling the user of both results.
    ii. Determine the length of each string and tell the user which is longer or if they are of equal length.
    iii. Compare the strings to see if they are the same. Let the user know the result.

12. Processes
a. Background and Foreground Jobs: Create a job that writes the date to an output file thrice, with a gap of 60 seconds and 180 seconds. Check whether the job is running and bring it to the foreground job. Stop the foreground job and make it run in the background. Finally, kill the background job and verify its status.
b. Scheduling a One-Time Backup: Create a job using at to back up files in one directory to another 10 minutes from now.
c. Scheduling Repeated Backups: Set up a cron job to backup the files in one directory to another every day at 10 am. Put the commands in file called mycron

Examination

Evaluation Scheme

The College will conduct all the semesters at the end of each semester. **The student will have to secure a minimum of 40% marks in the examination for all the above theory & practical courses. For Theory there will be separate passing in internal & external.**

I.   Internal Exam-40 Marks

(i) Test– 20 Marks

20 marks Test – Duration 40 mins

It will be conducted either using any open source learning management system such as Moodle (Modular object-oriented dynamic learning environment)Or a test based on an equivalent online course on the contents of the concerned course(subject)offered by or built using MOOC (Massive Open Online Course)platform.

(ii) 15 Marks – Assignment based on some of the self learning topics from the syllabus. (Assignment- Question Answer from/PPT presentation /Seminar in the class etc)

(iii) 5 Marks - Active participation in routine class instructional deliveries Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.

II.   External Examination- 60 Marks

(i) Duration - 2.00 Hours.

(ii) Theory question paper pattern:- All questions are compulsory. Question Based on Marks:

Q.1 Unit I,II and III 15 (Objective)

Q.2 Unit I   15 (3 out of 6 each of 5M OR any 1 out of 2 7M +any 2 out of 4 8M(4+4))

Q.3 Unit II   15 (3 out of 6 each of 5M OR any 1 out of 2 7M +any 2 out of 4 8M(4+4))

Q.4 Unit III 15 (3 out of 6 each of 5M OR any 1 out of 2 7M +any 2 out of 4 8M(4+4))

- All questions shall be compulsory with internal choice within the questions.

- Each Question may be subdivided into sub questions as a, b, c, d, e & f etc & the allocation of Marks depends on the weightage of the topic.

III   Practical Examination

- Each Major subject carries 50 Marks : 40 marks + 05 marks (journal)+ 05 marks(viva)

- Minimum 75 % practical from each core subject are required to be completed and written in the journal**.**

(Certified Journal is compulsory for appearing at the time of Practical Exam)

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