SU/BOS/Sci & Tech/ 315

Date: 16/05/2025

To,

The Principal / Director,
All Concerned Affiliated Colleges / Institutions,
Shivaji University, Kolhapur.

Subject: Regarding revised syllabus of **B. Tech. Part - II (Sem– III - IV)** degree
Programme (Affiliated College) under the Faculty of Science and
Technology as per NEP 2020.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, Nature of Question paper and equivalence of B. Tech. Part - II (Sem - III & IV) under the Faculty of Science & Technology as per NEP 2020.

No.	Course Syllabus
1	Civil Engineering
2	Mechanical Engineering
3	Mechanical and Mechatronic Engineering (Additive Manufacturing)
4	Electrical Engineering and Technology
5	Electrical and Computer Engineering
6	Electronics and Telecommunication Engineering
7	Electronics & Computer Science Engineering
8	Computer Science and Engineering
9	Artificial Intelligence & Machine Learning (AIML)
10	Data Science (DS)
11	Artificial Intelligence & Data Science (AIDS)

This Syllabus, shall be implemented from the academic year **2025-26** onwards. A soft copy containing the syllabus is attached herewith and it is available on university website **www.unishivaji.ac.in NEP-2020@suk (Online Syllabus)**

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October/ November 2025 & March / April 2026. These chances are available for repeater students, if any

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dr. S. M. Kubal
Dy. Registrar

Copy to: for Information and necessary action

1	The I/c Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations & Evaluation	7	Affiliation Section (T.1) (T.2)
3	The Chairpersan, Respective Board of Studies	8	P.G.Admission Section, /P.G Seminar Section
4	OE 4 Exam Section,	9	Computer Centre,/IT Cell
5	Eligibility Section,	10	Internal Quality Assorance Cell (IQAC)

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Shivaji University
Kolhapur

Revised Syllabus
as per
National Education Policy-2020
(NEP-2.0)

S. Y. B. Tech.

Computer Science and Engineering
(Data Science)

To be Implemented from
Academic Year 2025-26

First Year Exit: Teaching Methodology, Assessment and Evaluation

[I] As per R. R. B. Tech. 12.1 Rule: Award of Degree

If a student passes all the courses of first year and earns the requisite number of credits, the student will become entitled to Undergraduate Certificate (One year or two semesters) in the programme of his/her major subject. If he/she wants to exit, can exit the programme with UG Certificate. However, for the award of one year UG Certificate in Major with 44 credits, an additional 8 credits are required to earn.

[II] First Year Exit Course:

Methodology 1:

1. The students should complete two online certification courses (NPTEL) related to their programme, each of 3 credits. In addition to this, they will also need to complete 2 credits worth of two Virtual Lab work related to online certification courses. These additional 8 credits earn by students shall be based upon skill based vocational courses or internship/Apprenticeship.

2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study or programme. The skill based vocational courses shall be analogous to the Baskets/Areas provided by the concerned BoS.

3. The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.

4. **Examination scheme:** The marks gained from the two NPTEL Courses (3 credits each) are converted to a total of 100 marks. The report for the two Virtual Lab work of 2 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of the virtual lab experiments conducted, encompassing the methodology, results, and conclusions.

5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course. Similarly, for Virual Lab, the students are required to visit to website https://www.vlab.co.in and create their account. Log in the account and join the required lab and follow the instructions to compete the course (need to perform all listed experiments under that Lab). To fulfill the requirement of 06 credits, students can go for two courses each of 12 weeks.

Methodology 2:

1. The students should complete two online certification courses (NPTEL) related to their programme, each carrying 2 credits. In addition to this, they will also need to complete 4 credits worth of two physical internship/Apprenticeship (each of 40 hrs) work from relevant

industry. These additional 8 credits earned by the students shall be based upon skill based vocational courses or internship/Apprenticeship.

2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study/programme. The skill-based vocational courses shall be analogous with the list provided by the concerned BoS.

3. The student should complete two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices that adds 4 credits to simulate practical or experimental learning experiences in a controlled virtual environment.

4. **Examination scheme:** The marks gained from the two NPTEL Courses (2 credits each) are converted to a total of 100 marks. The report for the performed two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices of 4 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of two physical internship/Apprenticeship (each of 40 hrs) work along with certificate of internship/Apprenticeship from relevant industrial practices conducted, encompassing the methodology, results, and conclusions.

5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute.

The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course.

Direct Second Year Entry: Teaching Methodology, Assessment and Evaluation

[I] For the students admitted directly into the second year of a programme (at the entry level) from a different programme, earning of an additional 2 credits is mandatory.

[II] As per R. R. B. Tech. 13.3 Rule, For direct second year admitted students (at entry level) to concern programme, the earning of additional 2 credits is mandatory. It is required to conduct examination and evaluation for same at institute level at the time of third semester ESE examination. The evaluation report must be submitted to The Director, Board of Examination and Evaluation, Shivaji University, Kolhapur.

[III] Examination scheme:

Students admitted directly into the second year of a programme from another programme are required to complete a 2-credit entry-level course as per the prescribed curriculum. This course should be completed at their own pace to ensure alignment with the programme foundational requirements. End Semester Examination (ESE) of 100 marks will be conducted at the institute level. It is mandatory to organize the examination and evaluate the performance of such students at the institute level during the third semester ESE. The evaluation report must be submitted to The Director, Board of Examination and Evaluation, Shivaji University, Kolhapur.

Open Elective Courses: Teaching Methodology, Assessment and Evaluation

Open Elective (OE) courses other than faculty of Science and Technology through Massive Open Online Courses (MOOCs) allowing students to engage with a broad spectrum of ideas and knowledge areas. The OE courses are likely to be available online and can be completed at the student's own pace within a set timeframe. For OE course, students are required to visit to the website https://swayam.gov.in for registration and create an account. Afterward, students should Login the account and join the course assigned by the course coordinator and follow the instructions to compete the course. Minimum 25 students can register for one OE course in the concerned institute. There will be only one course coordinator for one OE course.

1. **For Semester-III,** OE theory course of 3 credits consists of Mid Semester Examination (MSE) of 30 Marks, In Semester Evaluation/Continuous Assessment (ISE/CA) of 10 Marks and End Semester Examination (ESE) of 60 Marks.

2. **For Semester-III,** OE practical lab course of 1 credit consists of In Semester Evaluation/Continuous Assessment (ISE/CA) of 25 Marks and End Semester Examination-Practical Oral Examination (ESE-POE) of 25 Marks. Course Coordinator assigned by Institute should complete the selected course practical through expert of that course.

3. **For Semester-IV,** OE theory course of 2 credits consists of Mid Semester Examination (MSE) of 30 Marks, In Semester

Evaluation/Continuous Assessment (ISE/CA) of 10 Marks and End Semester Examination (ESE) of 60 Marks.

4. The Mid Semester Examination (MSE) of 30 Marks based on selected OE Course will be conducted by Concerned Departmental Course Coordinator. The course expert of concerned faculty should set question paper of MSE and evaluate the same.

5. Online submitted assignments by students using SWAYAM platform for concerned OE course will be used for In Semester Evaluation/Continuous Assessment (ISE/CA) of 10 Marks by Concerned Departmental Course Coordinator appointed for particular course by Principal of the Institute. Assignments may be of varied in nature for OE course.

6. The setting of ESE question paper of Concerned OE Course should be done through course expert of concerned faculty as per University rules and is responsibility of Institute/ Departmental Course Coordinator.

7. Student may get failure in the said OE course or the examination may get delayed by SWAYAM, in either cases, ESE of the said course will be conducted as per the University rules.

Note: One OE course is to be floated by the institute for 60 intake.

Second Year Exit: Teaching Methodology, Assessment and Evaluation

[I] As per R. R. B. Tech. 12.2 Rule: Award of Degree

If a student passes all the courses of first year, second year and earns the requisite number of credits, the student will become entitled to Undergraduate Diploma (Two years or four semesters) in the programme of his/her major subject. If he/she wants to exit, can exit the programme with UG Diploma certificate. However, for the award of two years UG Diploma Certificate in Major with 88 credits, an additional 8 credits from Exit Courses are required to earn.

[II] Second Year Exit Course:

Methodology 1:

1. The students should complete two online certification courses (NPTEL) related to their programme, each of 3 credits. In addition to this, they will also need to complete 2 credits worth of two Virtual Lab work related to online certification courses. These additional 8 credits earn by students shall be based upon skill based vocational courses or internship/Apprenticeship.

2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study or programme. The skill based vocational courses shall be analogous to the Baskets/Areas provided by the concerned BoS.

3. The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.

4. **Examination scheme:** The marks gained from the two NPTEL Courses (3 credits each) are converted to a total of 100 marks. The report for the two Virtual Lab work of 2 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of the virtual lab experiments conducted, encompassing the methodology, results, and conclusions.

5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course. Similarly, for Virual Lab, the students are required to visit to website https://www.vlab.co.in and create their account. Log in the account and join the required lab and follow the instructions to compete the course (need to perform all listed experiments under that Lab). To fulfill the requirement of 06 credits, students can go for two courses each of 12 weeks.

Methodology 2:

1. The students should complete two online certification courses (NPTEL) related to their programme, each carrying 2 credits. In addition to this, they will also need to complete 4 credits worth of two physical internship/Apprenticeship (each of 40 hrs) work from relevant industry. These additional 8 credits earned by the students shall be based upon skill based vocational courses or internship/Apprenticeship.

2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study/programme. The skill-based vocational courses shall be analogous with the list provided by the concerned BoS.

3. The student should complete two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices that adds 4 credits to simulate practical or experimental learning experiences in a controlled virtual environment.

4. **Examination scheme:** The marks gained from the two NPTEL Courses (2 credits each) are converted to a total of 100 marks. The report for the performed two physical internship/Apprenticeship (each of 40 hrs) work from relevant industrial practices of 4 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of two physical internship/Apprenticeship (each of 40 hrs) work along with certificate of internship/Apprenticeship from

relevant industrial practices conducted, encompassing the methodology, results, and conclusions.

5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous updatation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website https://swayam.gov.in and create their account. Log in the account and join the required course and follow the instructions to compete the course.

Exit Course for Computer Science and Engineering (Data Science) After 1st Year

Exit option: Award of UG Diploma in Major with 44 credits and an additional 8 credits from following Exit Courses				
Sr. No	**Course Code**	**Course Title**	**Mode**	**Credits**
1	DS-EC-01	Basics of Computer Graphics	Online/offline certification Course orprojectof total 8 credits	8
		O R		
2	DS-EC-02	Computer Animation		8

DS-EC-01 - Basics of Computer Graphics

NPTEL courses

1. Computer Vision and Image Processing - Fundamentals and Applications Duration: 12 weeks
2. Engineering Graphics and Design -   Duration: 12 weeks

Virtual lab

1. Computer Graphics
2. Digital Image Processing

DS-EC-02 - Computer Animation

NPTEL courses

1. Engineering Drawing and Computer Graphics Duration: 12 weeks
2. ANIMATIONs -   Duration: 12 weeks

Virtual lab

1. 3D Printing Virtual Simulation Lab Digital Image Processing
2. Mechanisms and Robotics Lab

Earning of additional 2 mandatory credits for direct second year admitted students to Computer Science and Engineering (Data Science) branch

Sr. No.	Semester	Subject	Credit	Mode
1	III	Computer Programming	2	Online/offline certification Course or project of total 2credits

Computer Programming

Course Objectives:
1. To express algorithms and draw flowcharts in a language independent manner
2. To teach how to write modular, efficient and readable programs
3. To describe the techniques for creating program modules in C using functions and recursive functions.
4. To demonstrate creation of derived data types and perform operations on files.

Course Outcomes:

Upon successful completion of this course, the student will be able to –
1. Write, compile and debug programs in C language.
2. Design programs involving decision structures, loops, arrays and functions
3. Create and perform different file operations.
4. Use pointers to understand the dynamics of memory

Unit No.	Unit Name and Contents	No. of Lectures
1.	Introduction to the C Language – Algorithm, Pseudo code, Flow chart, Background, Identifiers, Data Types, Variables, Constants, Input / Output, Operators(Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associatively, Expression Evaluation, Type conversions	05
2.	Statements- Selection Statements(making decisions) – if and switch statements, Repetition statements (loops)-while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C, C++, Python Program examples	05
3.	Functions- Introduction to Structured Programming, Functions- basics, user defined functions, inter function communication (call by value, call by reference), Standard functions. Storage classes-auto, register, static, extern, scope rules, arrays to functions, recursive functions, C, C++, Python Program examples.	05
4.	Arrays– Basic concepts, one-dimensional arrays, two – dimensional arrays, multidimensional arrays, C, C++, Python Program examples. Pointers – Introduction (Basic Concepts), pointers to pointers, compatibility, Pointer Applications, Arrays and Pointers, Pointer Arithmetic, memory allocation functions, array of pointers, pointers to void, pointers to functions, command –line arguments, Introduction to structures and unions.	05
5.	Strings – Concepts, C, C++, Python Strings, String Input / Output functions, string manipulation functions, string /data conversion. Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling),Positioning functions	04

TEXT BOOKS:
1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, C engage Learning.
2. The C Programming Language by Brian Kernighan and Dennis Ritchie 2nd edition
3. Y. Daniel Liang, "Introduction to Programming using Python", Pearson,2012

REFERENCE BOOKS:
1. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2009.
2. Let Us C Yashavant kanetkar BPB.

Name of Programme: Computer Science and Engineering (Data Science)

B. Tech. Computer Science and Engineering (Data Science) curriculum structure (as per NEP 2020)

Semester - III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/ Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	DS2101	Statistic for Data Science	3	1	--	4	4	30	10	60	100
2	PCC	DS2102	Software Engineering	3	--	--	3	3	30	10	60	100
3	PCC	DS2103	Operating System	3	--	--	3	3	30	10	60	100
4	EL	DS2104	Object Oriented Programming	--	--	2	2	1	--	50	25	75
5	MDM	DS2105	Multi-disciplinary Minor–01	2	--	--	2	2	30	10	60	100
6	OE	DS2106	Open Elective-01	3	--	--	3	3	30	10	60	100
7	HSSM	DS2107	Employability Enhancement Skills-I	2	--	--	2	2	--	50	--	50
8	EL	DS2108	Data Structures Using C	--	--	2	2	1	--	50	25	75
9	HSSM	DS2109	Cyber Laws	2	--	--	2	2	--	50	--	50
10	OE	DS2110	Open Elective-01Lab	--	--	2	2	1	--	25	25	50
			Total	18	1	6	25	22	150	275	375	800

L-Lecture   T-Tutorial   P-Practical

MSE -Mid Semester Examination. ISE/CA in Semester Evaluation/Continuous Assessment

ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses(BSC)	Engineering Science Courses (ESC)	Programme Core-course (PCC)	Programme Elective Course (PEC)	Open Elective other than Particular programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular And Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	16	22	--	--	--	02	02	--	02
Semester Credits	--	--	10	--	06	--	04	02	--
Cumulative Sum	16	22	10	--	06	02	06	02	02

PROGRESSIVE TOTAL CREDITS: 44+22= 66

Name of Programme: Computer Science and Engineering (Data Science)

B. Tech. Computer Science and Engineering (Data Science) curriculum structure (as per NEP 2020)

Semester - IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	DS2201	Fundamental of Data Science	3	--	--	3	3	30	10	60	100
2	PCC	DS2202	Discrete Mathematics & Structure	3	--	--	3	3	30	10	60	100
3	PCC	DS2203	Computer Networks	3	1	--	4	4	30	10	60	100
4	MDM	DS2204	Multi-disciplinary Minor-02	2	--	--	2	2	30	10	60	100
5	OE	DS2205	Open Elective-02	2	--	--	2	2	30	10	60	100
6	HSSM	DS2206	Soft Skills	2	--	--	2	2	--	50	--	50
7	HSSM	DS2207	Employability Enhancement Skills-II	2	--	--	2	2	--	25	--	25
8	VEC	DS2208	Fundamental Of Data Science Lab	--	--	2	2	1	--	50	25	75
9	VSEC	DS2209	Python for Data Science Lab	--	--	2	2	1	--	25	25	50
10	VEC	DS2210	Mini Project Lab	--	--	2	2	1	--	25	25	50
11	BSC	DS2211	Environmental Science	2	--	--	2	Audit	30	10	60	100
12	VSEC	DS2212	Computer Maintenance Technology	--	--	2	2	1		50	--	50
			Total	**19**	**1**	**8**	**28**	**22**	**180**	**285**	**435**	**800+100 (Audit)**

L-Lecture   T-Tutorial   P-Practical

MSE-Mid Semester Examination ISE/CA. In Semester Evaluation / Continuous Assessment

ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Course (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than particular programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extra Curricular Activities (CCA)
Last Sem. Cumulative Sum	16	22	10	--	06	02	06	02	02
SemesterCredits	--	--	10	--	04	02	04+02(VEC)	--	--
Cumulative Sum	16	22	20	--	10	04	12	02	02

PROGRESSIVE TOTAL CREDITS : 66+22 = 88

PCC
DS2101 -Statistic for Data Science

TEACHING SCHEME	EXAMINATION SCHEME
Lecture : 3 Hrs/Week	MSE: 30 Marks
Tutorial : 1 Hrs/Week	ISE/CA: 10 Marks
Practical:--	ESE: 60 Marks
Course Credit:4	

Prerequisite: Mathematics

Course Objectives:
1. The Number Theory basic concepts useful for cryptography etc.
2. The theory of Probability, and probability distributions of single and multiple random variables
3. The sampling theory and testing of hypothesis and making inferences
4. Stochastic process and Markov chains.

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Apply the number theory concepts to cryptography domain
2. Apply the concepts of probability and distributions to some case studies
3. Correlate the material of one unit to the material in other units
4. Resolve the potential misconceptions and hazards in each topic of study.

Unit No.	Unit Name and Contents	No. of Lectures
1.	**Greatest Common Divisors and Prime Factorization:** Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers **Congruence:** Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences	07
2.	**Simple Linear Regression and Correlation:** Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least Squares Estimators, Inferences Concerning the Regression Coefficients, Prediction, Simple Linear Regression Case Study	06
3.	**Random Variables and Probability Distributions:** Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Statistical Independence. Discrete Probability Distributions: Binomial Distribution, Poisson distribution.	06
4.	**Continuous Probability Distributions:** Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial **Fundamental Sampling Distributions:** Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distribution of S2, t–Distribution, F Distribution.	07
5.	**Estimation & Tests of Hypotheses:** Introduction, Statistical Inference, Classical Methods of Estimation. Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits, Estimating the Variance, Estimating a Proportion for single mean, Difference between Two Means, between Two Proportions for Two Samples and Maximum Likelihood Estimation.	07

6.	**Stochastic Processes and Markov Chains:** Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, Nstep transition probabilities, Markov chain, Steady state condition, Markov analysis.	07

TEXT BOOKS:
1. Kenneth H. Rosen, Elementary number theory & its applications, sixth edition, Addison Wesley, ISBN 978 0-321-50031-1
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
3. S. D. Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi

REFERENCE BOOKS:
1. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications
2. T.T. Soong, Fundamentals of Probability and Statistics For Engineers, John Wiley & Sons Ltd, 2004.
3. Sheldon M Ross, Probability and statistics for Engineers and scientists, Academic Press

PCC
DS2102 -Software Engineering

TEACHING SCHEME	EXAMINATION SCHEME
Lecture: 3 Hrs/Week	MSE: 30 Marks
Tutorial:--	ISE/CA: 10Marks
Practical:--	ESE: 60 Marks
Course Credit:3	

Course Objectives:
1. To expose the students to basic concepts & principles of software engineering.
2. To make the student aware of the importance of SDLC in their project development work.
3. To expose the students to software testing techniques and software quality management.

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Comprehend systematic methodologies of SDLC (Software Development Life Cycle)
2. Discriminate competing and feasible system requirements indicating correct real world problem scope and prepare stepwise system conceptual model using stakeholder analysis and requirement validation.
3. Prepare SRS document for a project and Apply software design and development techniques
4. Develop a quality software project through effective team-building, planning, scheduling and risk
5. Understand testing methods at each phase of SDLC

Unit No.	Unit Name and Contents	No. of Lectures
1	**The software Problem:** Cost, Schedule & Quality, Scale and Change, Software Processes: Process & Project, Component Software Processes, Software Development Process Models, Project Management Process.	07
2	**Software Requirements Analysis & specification:** Value of Good SRS, Requirement Process, Requirements Specification, Other Approaches for Analysis, Validation	07
3	**Software Planning & Scheduling:** Responsibilities of Software Project Man agent, Project Planning, Project Scheduling, Project Staffing, People CMM, Risk Management	06
4	**Design:** Design Concepts, Function Oriented Design, Object Oriented Design, Detail Design, Verification, Metrics	06
5	**Coding & Testing** Coding & Code Review, Testing, Unit Testing, Black Box Testing, White Box Testing, Program Analysis Tools, Integration Testing, System Testing	07
6	**Software Reliability & Quality Management** Reliability, Software Quality, Software Quality Management System, ISO 9000, SEI capability Maturity Model, Six Sigma, Agile Software Development & Extreme Programming, Agile Project Management	08

TEXT BOOKS:

1. Software Engineering: A precise Approach - Pankaj Jalote (Wiley India) (Unit 1,2,4).
2. Fundamentals of Software Engineering – Rajib Mall (3rd Edition) (PHI) (Unit 5, 6).
3. Software Engineering by Jan Sommerville (9th Edition) Pearson
4. Software Engineering Principles & Practices by Rohit Khurana ITLESL (2nd Edition) Vikas Publishing House Pvt. Ltd. (Unit 3).

REFERENCE BOOKS:

1. Software Engineering - Concepts & Practices -- Ugrasen Suman (Cenage Learning)
2. Software Engineering Fundamentals -- Behrouz & Hudson (Oxford: Indian Edition 1st

PCC
DS2103-Operating System

TEACHING SCHEME	EXAMINATION SCHEME
Lecture: 3 Hrs/Week	**MSE: 30 Marks**
Tutorial: --	**ISE/CA: 10Marks**
Practical:--	**ESE: 60 Marks**
Course Credit:3	

Prerequisite: Fundamental of programming and memory management

Course Objectives:
1. To make the students understand basic concepts of operating system
2. To expose the students to various functions of the Operating system and their usage
3. To give hands on exposure to Linux commands and system calls.

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Understand operating systems functions
2. Write simple systems calls using fork ()
3. Understand synchronization and critical section problems
4. Remember Concept of dead locks and understand memory management concepts

Unit No.	Unit Name and Contents	No. of Lectures
1	**Overview of OS** Abstract view of an operating system, Fundamental principles of OS operations, OS interaction with the computer and user programs, Efficiency, system performance and user service, Batch Processing System, Multi programming System, Time Sharing System, The Real Time Operating System, Distributed operating system, Operation of OS, Operating system with monolithic structure, Virtual machine operating system, Kernel based operating system, Microkernel based operating system	8
2	**Processes, Threads and Synchronization** Processes and programs, Implementing processes, Threads, Process synchronization, Race condition, Critical Section, Synchronization approaches, Classic process synchronization problems, Semaphores, Monitors	7
3	**Process Scheduling:** Scheduling terminology and concepts, non-pre-emptive scheduling policies, Pre-emptive scheduling policies, Long, Medium- and short-term scheduling	6
4	**Deadlock:** What is deadlock, Deadlock in resource allocation, Handling Deadlocks: Deadlock Detection and Resolution, Deadlock prevention, Deadlock avoidance	6

5	**Memory Management:** Managing the memory hierarchy, Static and Dynamic Memory Allocation, Heap Management, Contiguous Memory Allocation and Non-Contiguous Allocation, Segmentation and Segmentation with paging, Virtual memory basics, Demand paging, Page replacement policies	7
6	**File systems and I/O systems:** Overview of file processing, Files and file operations, Fundamental file organizations and access methods, Layers of the Input Output control system, Overview of I/O system**.**	6

TEXT BOOKS:
1. Operating Systems -A Concept Based approach -Dhananjay M Dhamdhere (TMGH).3rd edition.
2. Operating System Concepts -Abraham Silberschatz, Peter B. Galvin & Grege Gagne (Wiley)

REFERENCE BOOKS:
1. Unix Concepts and Applications –Sumitabha Das (TMGH).
2. Operating System: Concepts and Design -Milan Milenkovic (TMGH)
3. Operating System with case studies in Unix, Netware and Windows NT -Achyut S. Godbole (TMGH).

EL

DS2104-Object Oriented Programming

TEACHING SCHEME	EXAMINATION SCHEME
Lecture: --	MSE: --
Tutorial:--	ISE/CA: 50 Marks
Practical: 2 Hrs/week	ESE: 25 Marks
Course Credit:1	

Pre- requisites: Basics of C Programming Language

Course Objectives:
1. To learn advanced features of the C++ programming language as a continuation of the previous course.
2. To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
3. To enhance problem solving and programming skills in C++ with extensive programming projects.
4. To become familiar with the LINUX software development environment.

Course Outcomes:
After the completion of this course, a successful student will be able to do the following:
1) Use the characteristics of an object-oriented programming language in a program.
2) Use the basic object-oriented design principles in computer problem solving.
3) Program with advanced features of the C++ programming language.
4) Develop programs in the LINUX programming environment.

List of Experiments
1. Program on Classes &objects
2. Program on Constructors & destructors
3. Program by using Friend function and Friend class
4. Inline Function, Static data members & member functions,
5. Array, Array of Objects, Pointer to Object, THIS pointer, Dynamic allocation operators (New & Delete)
6. Function overloading, Operator overloading (unary/binary/arithmetic/comparison)
7. Inheritance (multilevel, multiple, hybrid, Hierarchical)
8. Virtual function and Virtual class, early and late binding
9. Generic function &classes
10. STL
11. Exception Handling
12. File handling

TEXT BOOKS:
1. The Complete Reference C++ by Herbert Schild(Tata McGraw Hill) 4th Edition andonwards.
2. Object oriented Programming in C++ by Rajesh K.Shukla(Wiley) IndiaEdition

REFERENCE BOOKS:
1 Object-Oriented Programming with C++ by E. Balaguruswamy. (Tata McGraw-Hill) 6th Edition and onwards
2. Object oriented Programming with C++- by SouravSahay (Oxford) 2ndedition

DS2105-Multidsciplinary Minor-01
(C Programming)

TEACHING SCHEME	EXAMINATION SCHEME
Lecture : 2 Hrs/Week	**MSE: 30 Marks**
Tutorial : --	**ISE/CA: 10Marks**
Practical:--	**ESE: 60 Marks**
Course Credit:2	

Prerequisite: Basic knowledge of Electronics and Computers

Course Objectives:
1. To learn programming language C
2. To learn problem solving techniques.
3. To analyse problems and write programs using C language

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Articulate the principles of procedure-oriented problem solving and programming.
2. Explain programming fundamentals including statements, control flow and recursion
3. Able to formulate problems and implement algorithms in C.
4. Demonstrate file operations using file handling concepts through developing applications.

Unit No.	Unit Name and Contents	No. of Lectures
1	**Introduction to C:** The Form of a C Program, The Library and Linking, Separate Compilation, compiling a C Program, C's Memory Map; Expressions – The Basic Data Types, Modifying the Basic Types, Identifies Names, Variables, The Four C Scopes, Type Qualifiers-const, volatile, Storage Class Specifiers; Statements - Selection Statements, Iteration Statements, Jump Statements, Expression Statements, Block Statements.	06
2	**Console I/O & Basics of Array and Strings.** Console I/O: Reading and Writing Characters, Reading and Writing Strings, Formatted Console I/O, printf(), scanf(), Suppressing Input. Arrays and Strings- Two-Dimensional Arrays, Arrays of Strings, Multidimensional Arrays, Array Initialization, Variable-Length Arrays.	05
3	**Functions:** The General Form of a Function, Understanding the Scope of a Function, Parameter passing, passing arrays to functions, Function Arguments, argc and argv-Arguments to main (), The return Statement, What Does main () Return? Recursion, Function Prototypes, Declaring Variable Length Parameter Lists, The inline Keyword.	05
4	**Structures, Unions, Enumerations, and typedef:** Structures, Arrays of Structures, Passing Structures to Functions, Structure Pointers, Arrays and Structures Within Structures, Unions, Bit-Fields, Enumerations, Using sizeof to Ensure Portability, typedef.	05
5	**File I/O :** File I/O, Standard C vs. Unix File I/O, Streams and Files, File System Basics, fread( ) and fwrite(), fseek() and Random-Access I/O, fprintf() and fscanf(), The Standard Streams.	05
6	**Header Files:** Creating own header file and accessing it in 'C' program, study and use of inbuilt functions of string.h, math.h, float.h , ctype.h, time.h	04

TEXT BOOKS :

1. C the Complete Reference by Herbert Schild (Tata McGraw Hill) 4th Edition.
2. The C Programming Language- Brian W. Kernighan, Dennis Ritchie 2nd Edition.

REFERENCE BOOKS:

1. Programming in ANSI C by E. Bala Guruswamy.(Tata McGraw Hill)4th Edition.
2. Let Us C By Yashavant P. Kanetkar, 5th Edition.

DS2106-Open Elective-01

1. Programming for Everyone

TEACHING SCHEME	EXAMINATION SCHEME
Lecture : 3 Hrs/Week	**MSE: 30 Marks**
Tutorial : --	**ISE/CA: 10Marks**
Practical : --	**ESE: 60 Marks**
Course Credit:3	

Prerequisite: Knowledge of Mathematics required.

Course Objectives:
1. Introduce learners to basic programming concepts, including variables, data types, control structures, functions, and algorithms
2. Foster an understanding of algorithm design, logic building, and problem decomposition.
3. Build confidence in individuals from non-technical backgrounds to explore further learning in software development.

Course Outcomes:
1. **Develop Fundamental Programming Skills**: Introduce learners to basic programming concepts, including variables, data types, control structures, functions, and algorithms.
2. **Problem-Solving Techniques**: Equip learners with the ability to analyze and solve problems using logical reasoning and computational thinking.
3. **Promote Accessibility to Programming**: Provide a non-intimidating environment for beginners to gain confidence and foster interest in coding.

Unit No.	Unit Name and Contents	No. of Lectures
1	What is Programming, importance of programming in Data Science. Types of Programming. Different programming languages.	6
2	What is compiler and interpreter, Mechanism of program execution, Compilers for different languages	6
3	Concepts of structural program development, concept of data types; precedence and associatively of operators;	6
4	Difference between structural programming and Object oriented programming. Features of Object oriented programming	6
5	conditional transfer; deterministic and in-deterministic loops; recursions; functions and procedures - call by value, call by reference and their differences; programming for numerical methods;	6
6	files - basic concept of various types of file access methods, various statements for file handling, applications of programming languages	6

TEXT BOOKS:
1. Tennence W.Pratt, "Programming languages design and implementation", Prentice Hall of India
2. Balagurusamy:ANSI C TMH
3. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
4. Fundamentals of Programming Languages, R. Bangia,Cyber Tech

REFERENCE BOOKS:
1. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2009.

DS2107-Employability Enhancement Skills-I

TEACHING SCHEME	EXAMINATION SCHEME
Lecture : 2 Hrs/Week	MSE: --
Tutorial : --	ISE/CA: 50 Marks
Practical:--	ESE: --
Course Credit:2	

Prerequisite: Communication skills, Problem solving and thinking

Course Objectives:
1. To develop analytical abilities
2. To develop communication skills
3. To introduce the students to skills necessary for getting, keeping and being successful in a profession.
4. To expose the students to leadership and team-building skills.

Course Outcomes:
On completion of the course, student will be able to:
1. Have skills and preparedness for aptitude tests.
2. Be equipped with essential communication skills (writing, verbal and non-verbal)
3. Master the presentation skill and be ready for facing interviews.
4. Build team and lead it for problem solving.

Unit No.	Unit Name and Contents	No. of Lectures
1	**Soft Skills** Soft skills Vs hard skills, Skills to master, Interdisciplinary relevance, Global and national perspectives on soft skills. Resume, Curriculum vitae, How to develop an impressive resume, Different formats of resume – Chronological, Functional, Hybrid, Job application or cover letter, Professional presentation-planning, preparing and delivering presentation, technical writing.	6
2	**Communication basics** • The importance of communication in engineering • Types of communication: verbal, non-verbal, and written • The communication process: sender, receiver, message, channel, noise, feedback • Barriers to effective communication and strategies to overcome them	5
3	**Arithmetic Reasoning** Aspects of intelligence, Bloom taxonomy, multiple intelligence theory, Number sequence test, mental arithmetic (square and square root, LCM and HCF, speed calculation, reminder theorem)	5
4	**Mathematical Reasoning** Introduction to Logic, Set Theory, Number Systems, Permutations and Combinations, Probability,	4
5	**Analytical Reasoning** Matching, Selection, Arrangement, Verifications (Exercises on each of these types). Verbal aptitude (Synonym, Antonym, Analogy)	5
6	**Quantitative Ability** Data Interpretation, Problem-Solving, Trigonometry	4

TEXT BOOKS:

1. R. Gajendra Singh Chauhan, Sangeeta Sharma, "Soft Skills- An integrated approach to maximize personality", ISBN: 987-81-265-5639-7, First Edition 2016, Wiley.
2. Wren and Martin, "English grammar and Composition", S. Chand publications.
3. R. S. Aggarwal, "A modern approach to verbal reasoning", S. Chand publications.

REFERENCE BOOKS:

1. Philip Carter, "The Complete Book Of Intelligence Test", John Willey & Sons Ltd.
2. Philip Carter, Ken Russell, "Succeed at IQ test", Kogan Page
3. Eugene Ehrlich, Daniel Murphy, "Schaum's Outline of English Grammar", McGraw Hills.
4. David F. Beer, David A. McMurrey, "A Guide to Writing as an Engineer", ISBN : 978-1-118-30027-5 4th Edition, 2014, Wiley

DS2108-Data Structure using C

TEACHING SCHEME	EXAMINATION SCHEME
Lecture : --	MSE: --
Practical : 2 Hrs/week	ISE/CA: 50Marks
Tutorial :--	ESE: 25 Marks
Course Credit:1	

Prerequisite: Basics of programming

Course Objectives:
1. To make the students familiar with basic data structures.
2. To provide students with foundation in computer programming/ problem.
3. To teach the students to select appropriate data structures in computer applications.
4. To provide the students with the details of implementation of various data structures.

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Identify the appropriate data structure for specific application.
2. Design and analyze programming problem statements.
3. Chose appropriate sorting and searching algorithms.
4. Outline the solution to the given software problem with appropriate data structure.

List of Experiments:
1. Implementation of array of structures.
2. Implementation of pointers to structures.
3. Implementation of stack using array.
4. Implementation of queue using array.
5. Implementation of singly, doubly and Circular linked list.
6. Implementation of stack using linked list.
7. Implementation of queue using linked list.
8. Implementation of sequential search and Binary Search in an array.
9. Implementation of different Sorting techniques.
10. Implementation of operations in a binary search tree.
11. Implementation of AVL tree.
12. Implementation of Graph.

TEXT BOOKS :
1. Schaum's Outlines Data Structures – Seymour Lipschutz (MGH)
2. Data Structures- A Pseudocode Approach with C – Richard F. Gilberg and Behrouz A. Forouzon 2nd Edition

REFERENCE BOOKS:
1. Data Structure using C- A. M. Tanenbaum, Y. Langsam, M. J. Augenstein (PHI)
2. Data Structures and Algorithm Analysis in C, 2 Edition, by Weiss, Pearson Education India.

DS2109-Cyber Laws

TEACHING SCHEME	EXAMINATION SCHEME
Lecture : 2 Hrs/Week	MSE: --
Tutorial : --	ISE/CA: 50 Marks
Practical :--	ESE: --
Course Credit:2	

Prerequisites: -Basic Knowledge of Internet

Course Objectives:
Throughout the course, students will be expected to demonstrate their understanding of Cyber Laws & Ethics by being able to do each of the following:
1. Understand Cyber Space, Cyber Crime, Cyber Laws, Information Technology, Internet, Internet Services
2. Know Legal Aspects of Regulation concerned with Cyber Space,Technology and Forms of Cyber Crimes
3. Understand Computer Crimes and Cyber Crimes, Cyber Crime in Global and Indian Response.
4. Understand Criminal Liability, Cyber Crime implications and challenges.
5. Learn Precaution & Prevention of Cyber Crimes, Human Rights perspective of Cyber Crime

Course Outcome: -
On completion of this course, the students should be able to:
1. Understand Cyber Space, Cyber Crime, Information Technology,Internet & Services.
2. Outline of the basics understanding of Internet and Jurisdictional Aspects in Cyber Law and cyber-crime.
3. Illustrate the roles of E-Contracting and E- Commerce.
4. Explain E-Governance and Intellectual Property Issues in Cyber Space.
5. Describe the ways of precaution and prevention of Cyber Crime as well as Human Rights.

Unit No.	Unit Name and Contents	No. of Lectures
1	**Information Technology & Cyber Crimes:** Introduction, Glimpses, Definition and Scope, Nature and Extent, Know no Boundaries, Rapid Transmission and Accuracy, Diversity and Span of Victimization, Cyber World, Inadequacy of Law, Influence of Teenagers **Information Technology:** Definition & Perspective, Growth & Future, Various Facets & Dimensions. **Regulatory Perspective on Technology:** Impact of Information and Technology, Regulation of Cyber Space, Legal Aspects of Regulation.	6
2	**INTRODUCTION AND JURISDICTIONAL ASPECTS IN CYBER LAW:** Understanding Computers, Internet and Cyber Laws, Need for Cyber Law, Jurisdictional Aspects in Cyber Law- Types of jurisdiction, Jurisdiction under IT Act, 2000. CYBER CRIMES- Understanding cyber-crimes and its types, Right to Privacy and Data Protection on Internet, Different offences under IT Act, 2000.	5
3	**ROLE OF E-CONTRACTING AND E- COMMERCE:** Data protection, Digital signature and Electronic Signature and their role in cyber security. E-CONTRACTING: Salient features of E-contract, Formation of E-contract and types, E-mail Contracting, Indian Approach on E-contracts, Indian Approach on E-contracts. E-COMMERCE: Salient Features and advantages, Models of E-commerce like B2B, B2C,Indian Laws on E-commerce.	5
4	**INTELLECTUAL PROPERTY ISSUES IN CYBERSPACE:** E-Governance - E Government and E Governance, Components of E Governance, Initiatives taken in India (Various E Governance Programs) Interface with Copyright Law, Trademarks & Domain Names Related issues, Dispute Resolution in Cyberspace.	5
5	**Cyber Crimes: Discovery and Appreciation of Evidences:** Introduction, Law of Evidence, Evidences in Cyber Crimes: Challenges and Implications, Computer Generated Evidence and their Admissibility, Judicial Interpretation of Computer related Evidence	5

| 6 | **Prevention of Cyber Crimes: Precaution and Prevention:** Introduction, Awareness and Law Reforms, Improving Criminal Justice Administration, Increasing International Cooperation, Curricular Endeavors and Checking Kids' Net Addiction, Role of Guardians, Mobile Pornography: No Nearer Solution in Sight, Self-regulation in Cyber Space. | 4 |

TEXT BOOKS:
1. Karnika Seth, Computers, Technology and the new internet laws, 2016.
2. Dr Pramod Kr.Singh, "LawsonCyber Crimes[Along with IT Act and RelevantRules]" BookEnclave Jaipur India..

REFERENCE BOOKS:
1. Cyberspace law commentaries and Materials- Yee fen Lim
2. Cyber law – Yatindra Sinha
3. VivekSood, "Cyber Law Simplified", 1st Edition, Fourth Reprint TMH, 2008.
4. Harish Chander, Cyber Laws and IT Protection, 1st Edition, PHI/Pearson, 2014.

DS2110-Open Elective-01 Lab
(1. Programming for Everyone)

TEACHING SCHEME	EXAMINATION SCHEME
Lecture: --	MSE:
Tutorial :--	ISE/CA: 25 Marks
Practical: 2 Hrs/week	ESE: 25 Marks
Course Credit:1	

Course Objectives:
1. Provide practical experience in writing, executing, and refining programs using a beginner-friendly programming language.
2. Enhance problem-solving skills through structured coding exercises and real-time problem-solving sessions.
3. Teach the basics of debugging and error handling in programming environments.
4. Encourage creative exploration of programming by working on mini-projects and experiments during lab sessions.

Course Outcomes:
1. **Apply fundamental programming concepts** to develop hands-on solutions for simple computational problems.
2. **Implement, test, and debug code** effectively using an Integrated Development Environment (IDE) or coding platform.
3. **Translate algorithms into functional code** while adhering to best practices in programming.
4. **Collaborate with peers** to solve problems and share coding techniques, fostering teamwork in a lab setting.

Note: Following experiments should conduct either in 'c', 'c++' or 'python'

List of Experiments:
1. Write a program to display a welcome message and accept user input (e.g., name and age)
2. Create a calculator program to perform basic arithmetic operations (addition, subtraction, multiplication, and division)
3. Write a program to determine whether a given number is positive, negative, or zero. [Conditional statements (if, else if, else]
4. Implement a program to print the first n natural numbers and their sum Loops [(for, while), control flow, and summation. [
5. Create a function to calculate the factorial of a number. (Function definition, calling, and recursion.)
6. Write a program to find the largest and smallest element in an array (or list in Python) [Arrays (C/C++) and lists (Python).]
7. Implement a program to check if a given string is a palindrome. [String manipulation, loops, and conditionals.]
8. Write a program to read and write data to a file. [File operations (open, read, write, close).]
9. Create a program to model a simple "Student" class with attributes (name, roll number, marks) and a method to display details. [Object-oriented programming (classes, objects)]
10. Implement the bubble sort algorithm to sort a list of numbers. [Algorithms, loops, and nested structures]

TEXT BOOKS:
5. Tennence W.Pratt, "Programming languages design and implementation", Prentice Hall of India
6. Balagurusamy:ANSI C TMH
7. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS
8. Fundamentals of Programming Languages, R. Bangia,Cyber Tech

REFERENCE BOOKS:
2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2009.

PCC
DS2201-Fundamentals of Data Science

TEACHING SCHEME	EXAMINATION SCHEME
Lecture: 3 Hrs/Week	MSE: 30 Marks
Tutorial:--	ISE/CA: 10 Marks
Practical:--	ESE: 60 Marks
Course Credit:3	

Prerequisite: Knowledge of Statistics, Data Structures

Course Objectives
1. To provide the students with the basic knowledge of Data Science.
2. To make the students develop solutions using Data Science tools.
3. To introduce them to Python packages and their usability.

Course Outcomes
Upon successful completion of this course, the students will be able to:
1. Summarize the basics of data science and its process.
2. Construct solution to a given problem using knowledge of tools for Data Science.
3. Build a solution to a given problem using NumPy package.
4. Explain functions of Python libraries.

UNIT NO.	UNIT NAME & DETAILS	NO. OF LECTURES
1.	**Data Science and Its Scope**: What Is Data Science, Data Science and Statistics, Role of Statistics in Data Science, A Brief History, Difference between Data Science and Data Analytics, Knowledge and Skills for Data Science Professionals, Some Technologies used in Data Science, Benefits and uses of data science, Facets of data.	7
2.	**The data science process:** Overview, defining research goals and creating a project charter, retrieving data, Cleansing, integrating, and transforming data, Exploratory data analysis, Build the models, presenting findings and building applications on top of them.	6
3.	**Data Analysis Tools for Data Science and Analytics:** Data Analysis Using Excel: Introduction, Getting Started with Excel, Format Data as a Table, Filter and Sort, Perform Simple Calculations, Data Manipulation Sorting and Filtering Data Derived Data, Highlighting Data, Aggregating Data: Count, Total Sum, Basic Calculation using Excel, Analyzing Data using Pivot Table/Pivot Chart, Descriptive Statistics using Excel, Visualizing Data using Excel Charts and Graphs, Visualizing Categorical Data: Bar Charts, Pie Charts, Cross Tabulation, Exploring the Relationship between Two and Three Variables: Scatter Plot Bubble Graph and Time- Series Plot.	8

	Introduction to NumPy: Creating Arrays from Scratch, NumPy Standard Data Types, The Basics of NumPy Arrays, Array Indexing, slicing, reshaping, Concatenation, splitting, Computation on NumPy Arrays: Universal Functions, Aggregations: Min, Max, Comparison operator, Boolean arrays.	**6**
5.	**Data Manipulation with Pandas:** Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing. Combining Datasets: Concat and Append, Combining Datasets: Merge and Join, Aggregation and Grouping, Pivot Tables	**7**
6.	**Visualization with Matplotlib:** General Matplotlib Tips, Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Bindings, and Density.	**6**

TEXT BOOKS:

1. Davy Cielen,ArnoD.B.Meysman,MohamedAli,"IntroducingDataScience",Manning Publications.[Unit 1 and 2]

2. JakeVanderPlas,"PythonDataScienceHandbook:EssentialToolsforWorkingwithData",

O'REILLY Publication.[Unit 3,4,5]

3. DR.AmarSahay,"EssentialsofDataScienceandAnalytics",O'REILLYPublication.
[Unit 1 and 3]

REFERENCE BOOKS:

1. Data Science from Scratch :First Principles with Python, O" Reilly Media, 2015. Glenn J. Myatt John,

Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, Wiley Publishers, 2000.

DS2202-Discrete Mathematics & Structures

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs/Week	MSE-30 Marks
Tutorial :--	ISE/CA-10 Marks
Practical:--	ESE-60 Marks
Credit: 3	

Prerequisite: Basic Mathematics

Course Objectives:
1. Student should understand the mathematical logic related to computer science areas.
2. To enhance the problem solving skills in the areas of theoretical computer science.
3. To use mathematical concepts in the development of computer applications.

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Apply logic concepts in designing a program.
2. Illustrate basic set concepts & apply operations on set.
3. Minimize the Boolean Function.
4. Apply basic concepts of probability to solve real world problem.
5. Represent data structures using graph concepts.
6. Design abstract machine, detect deadlocks.

Unit No.	Unit Name and Contents	No. of Lectures
1	**Mathematical Logic:** Statements & Notations, Connectives, Statement Formulas & truth table, Well formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological Implications, Functionally complete set of connectives, Other connectives, Normal Forms, Theory of Inference for statement calculus.	08
2	**Set Theory:** Basic concepts of set theory, Operations on Sets, Ordered pairs & n-tuples, Cartesian product	05
3	**Relations & Functions:** Relations., Properties of binary relations., Matrix & Graph Representation of Relation., Partition & covering of Set., Equivalence Relations. , Composition of Binary Relation., POSET & Hasse Diagram., Functions, Types of Functions, Composition of functions..	06
4	**Algebraic Systems:** Algebraic Systems: Examples & general properties., Semi groups & Monoids, Groups: Definitions & Examples, Subgroup & Homomorphism.	07
5	**Lattice and Boolean Algebra:** Lattice as partially ordered sets., Lattice as Algebraic Systems., Special Lattices., Boolean Algebra: Definitions & examples, Boolean Functions., Representation & Minimization of Boolean Functions.	08
6	**Graph Theory:** Basic concepts of graph theory., Paths, Reachability & Connectedness, Matrix Representations of Graphs., Storage Representation & Manipulations of Graphs. PERT & Related technologies.	05

TEXT BOOKS:

1. "Discrete Mathematical Structures with Application to Computer Science" by J. P. Tremblay& R. Manohar (MGH International)

REFERENCE BOOKS:

1. Discrete Mathematics - Semyour Lipschutz, MarcLipson (MGH), Schaum's outlines.
2. Discrete Mathematics and its Applications - Kenneth H. Rosen (AT&T Bell Labs) (mhhe.com/rosen)
3. Discrete Mathematical Structures – Bernard Kolman, Robert Busby, S.C.Ross and
4. Nadeemur-Rehman (Pearson Education)

DS2203 -Computer Networks

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 3 Hrs. / Week	MSE-30 Marks
Tutorial: 1 Hrs/Week	ISE/CA-10 Marks
Practical: --	ESE-60 Marks
Credit: 4	

Prerequisite: --Basic Computer knowledge

Course Objectives:
1. To perceive fundamental concepts of Computer Networks
2. To understand layered architecture and basic networking protocols
3. To illustrate the TCP/IP protocol internal details

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Student will understand the fundamental concepts of Computer Networks.
2. Student will able to differentiate OSI and TCP/IP layered architecture
3. Student will apply practical knowledge of network and will able to form network,
4. Student will apply the principals of socket programming in the networks.

Unit No.	Unit Name and Contents	No. of Lectures
1	**Introduction to Computer Network:** Overview of OSI layer Model and TCP/IP protocol model, Addressing, Underlying technologies for LANs, WANs, and Switched WANs.	06
2	**Data Link Layer** Design issues for Data Link Layers, Framing methods, Error control: detection and correction, Flow control, Elementary Data Link protocols, Sliding window Protocols, Go back n, Selective repeat.	06
3	**Medium Access Control Sub layer:** Static and Dynamic channel allocation, Multiple Access protocols ALHOA, CSMA, Collision Free Protocols, Ethernet: IEEE 802.3, IEEE 802.4, IEEE 802.5 standards, Wireless LANS 802.11 standards	07

4	**Network Layer:** IPv4 Addresses: Classful Addressing Other Issues, Sub-netting and Super netting, Class less Addressing, Delivery, Forwarding and routing; Routing methods: Shortest path, Link state, Distance vector routing and broadcast routing, Congestion control algorithms: Principles, Congestion prevention policies, congestion control in datagram subnet, Load Shedding, Jitter Control.	07
5	**Internet Protocol:** IP Datagram format, Fragmentation and reassembly models, ARP, RARP, ICMP, IGMP	06
6	**Transport Layer:** The Transport service primitives, UDP: Process to Process communication, User Datagram Format, Operationand uses of UDP. TCP: TCP Services and Features, TCP segment format, TCP Connections, Flow and error control in TCP, TCP Timers; Berkeley Sockets: Socket Addresses, Elementary Socket system calls byte ordering and address conversion routines, connectionless iterative server, connection oriented concurrent server, TCP and UDP Client server Programs.	06

TEXT BOOKS:

1. TCP/IP protocol suit 4th Ed. – Behrouz A. Forouzen (Tata Mag. Hill)
2. Computer Networks – Andrew S. Tanenbaum (PHI)
3. Unix Network Programming – W. Richard Stevens (PHI)

REFERENCE BOOKS:

1. TCP/IP Illustrated, The Protocols, Vol. I – W. Richard Stevens, G. Gabrani (Pearson Education.)
2. Internetworking with TCP/IP, Vol. I Principles, Protocols, and Architectures – D. E. Comer (Pearson Ed.)
3. Internetworking with TCP/IP, Vol. III, Client-Server Programming and Application (2nd Ed.) – D. E. Comer, David L. Stevens (Pearson Ed.)

DS2204-Multi-Disciplinary Minor-02
Python Programming

TEACHING SCHEME	EXAMINATION SCHEME
Theory: 2 Hrs./Week	MSE-30 Marks
Tutorial: --	ISE/CA-10 Marks
Practical: --	ESE-60 Marks
Credit:2	

Prerequisite: Mathematics, Statistics

Course Objectives:
1. To understand Python programming language
2. To program simple algorithms for Data Science applications
3. To Understand different libraries used in Data Science
4. To apply Python to solve some problems in Data Science.

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Identify the need for data science and solve basic problems using Python built-indata types and their methods.
2. Design an application with user-defined modules and packages using OOP concept
3. Employ efficient storage and data operations using NumPy arrays.
4. Apply powerful data manipulations using Pandas.
5. Do data preprocessing and visualization using Pandas

Unit No.	Unit Name and Contents	No. of Lectures
1	**Introduction to Python -** Why Python? - Essential Python libraries - Python Introduction- Features, Identifiers, Reserved words, Indentation, Comments, Built-in Data types and their Methods: Strings, List, Tuples, Dictionary, Set - Type Conversion- Operators. Decision Making- Looping- Loop Control statement- Math and Random number functions. User defined functions - function arguments & its types, Operators.	05
2	**User defined Modules and Packages in Python-** Files: File manipulations, File and Directory related methods - Python Exception Handling. OOPs Concepts – Class and Objects, Constructors – Data hiding- Data Abstraction- Inheritance.	05
3	**NumPy Basics:** Arrays and Vectorized Computation- The NumPy ndarray- Creating ndarrays- Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing - Boolean Indexing-Transposing Arrays and Swapping Axes. Universal Functions: Fast Element-Wise Array Functions- Mathematical and Statistical Methods-Sorting Unique and Other Set Logic.	05
4	**Introduction to pandas Data Structures:** Series, DataFrame, Essential Functionality: Dropping Entries Indexing, Selection, and Filtering- Function Application and Mapping- Sorting and Ranking. Summarizing and Computing Descriptive Statistics- Unique Values, Value Counts, and Membership. Reading and Writing Data in Text Format.	05
5	**SciPy Library for statistics**, Basic statistics, parametric and non-parametric techniques for comparing Means. Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values	05
6	**Detecting and Filtering Outliers**- String Manipulation: Vectorised String Functions in pandas. Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots.	04

TEXT BOOKS:

1. Y. Daniel Liang, "Introduction to Programming using Python", Pearson,2012
2. Data Analytics using Python, Bharti Motwani,Wiley Publications
3. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython",O'Reilly, 2nd Edition,2018.
4. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data",O'Reilly, 2017

REFERENCE BOOKS:

1. Wesley J. Chun, "Core Python Programming", Prentice Hall,2006.
2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2009.

OE
DS2205 -Open Elective-II
1.E-Commerce & Digital Marketing

TEACHING SCHEME	EXAMINATION SCHEME
Theory: 2Hrs./Week	MSE-30 Marks
Tutorial:--	ISE/CA-10 Marks
Practical : --	ESE-60 Marks
Credits:2	

Course Objectives:

1. To get the knowledge about business advantages of thee-commerce and digital marketing and
its importance
2. To develop a digital marketing plan and to make SWOT analysis
3. To get introduced with various digital channels, business tools in social networking
4. To understand the optimization of a Website and SEO optimization

Course Outcomes:

1. Students will be able to identify the importance of thee-commerce and digital marketing for business
success
2. Students will be able to create a digital marketing plan, starting from the SWOT analysis and defining
a target group
3. Students will be able to identifying digital channels, business tools used in social networking
4. Studentswillbeabletodemonstratetheoptimizationofwebsiteusingbusiness tools.

UNIT NO.	UNITNAME&DETAILS	NO. OF LECTURES
1.	**Introduction to E-commerce, frameworks & architectures** **Introduction:** The term "E-Commerce", Business models related to E-Commerce, Technical and economic challenges **Frameworks and architectures:** Actors and stakeholders, Fundamental sales process, Technological elements	4
2.	**B2Cbusiness, B2Bbusiness** **B2C Business:** The process model and its variants, The pricing challenge, The fulfillment challenge, The payment challenge, B2C-business and CRM, B2C software systems **B2B business:** The process model and its variants, B2B software systems	4

3.	**Introduction to Digital Marketing** How digital technologies transformed marketing?, Definitions-digital marketing and multichannel marketing- Paid, owned and earned media, the growing range of digital marketing platform, digital marketing strategy-key features of digital marketing strategy, applications of digital marketing, benefits of digital marketing, alternative digital business models, difference between-commerce and e-business, challenges in developing and managing digital marketing strategy	**5**
4.	**Online market place analysis & macro environment** Introduction: situation analysis for digital marketing, the digital marketing environment, understanding customer journeys, online consumer behavior and implications for marketing, business models for e-commerce Online macro environment: Technological forces, economic forces,politicalforces,Legalforces,socialforcesandculturalforces	**6**
5.	**Digital Marketing Strategy and relationship marketing** Digital Marketing strategy development: how to structure digital marketing strategy, strategy implementation Relationship marketing using digital platforms: Introduction, the challenge of customer engagement, customer lifecycle management	**5**

TEXT BOOKS:

1. IntroductiontoE-commerce:CombiningBusiness&InformationTechnology1stEdition,(2016) Martin Kutz. & bookboon.com
2. DigitalMarketing:Strategy,ImplementationandPractice,6thEditionbyDaveChaffey,Fiona Ellis-Chadwik, Pearson Education.

REFERENCE BOOKS:

1. The Beginner'sGuidetoDigitalMarketing(2015).DigitalMarketer.
   Pulizzi, J.(2014) Epic Content Marketing, McGraw Hill Education.
2. "ElectronicCommerce",Jeffrey F RayportandBharatBhasker,TataMcGrawHill.

HSSM
DS2206- SOFT SKILLS

TEACHING SCHEME	EXAMINATION SCHEME
Theory :2 Hrs/week	MSE:--
Tutorial:--	ISE/CA:50 Marks
Practical:--	ESE:--
Credit: 2	

Course Objectives:
1. To make the engineering students aware of the importance, the role and the content of soft skillsthrough instruction, knowledge acquisition, demonstration and practice.
2. To develop and nurture the soft skills of the students through individual and groupactivities.
3. To expose students to right attitudinal and behavioral aspects and to build the same through activities
4. To encourage the all-round development of students by focusing on soft skills.

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Effectively communicate through verbal/oral communication and improve the listening skills
2. Actively participate in group discussion / meetings / interviews and prepare & deliverpresentations.
3. Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of teamwork, Inter-personal relationships, conflict management and leadership quality.

Unit No.	Unit Name	No. of Lectures
1	Understanding Communication Skills: Verbal Communication - Effective Communication -Active listening – Articulation Paraphrasing – Feedback Non- Verbal Communication - Body Language of self and others	5
2	Behavioral Skills /Self Development: SWOT Analysis, Confidence improvement, values, Positive attitude, positive thinking and self esteem.	4
3	Leadership and Team Building Culture and Leadership- Salient Features of Corporate Culture, Leadership Styles,Leadership Trends Team Building- Team Development Stages, Types of Teams, Attributes of a successful team – Barriers involved	6
4	Developing Writing skills E-mail writing, report writing, resumes writing, practice.	4
5	Stress and Time Management Stress in Today 's Time- Identify the Stress Source, Signs of Stress, Ways to Cope withStress. Healthier Ways to Combat Stress, steps to be taken in the Organizations: Open communication, Time Management, Working towards Your Goals, Smart Work, Prioritizeyour Tasks	6
6	Professional Skill Ethics, Etiquette and Mannerism-All types of Etiquette (at Meetings, Etiquette at Dining. Involuntary Awkward Actions, Public Relations Office(PRO)'s Etiquettes)	4

TEXT BOOKS :

1. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd.,Delhi
2. Gajendra Singh Chauhan, Sangeeta Sharma: Soft Skills – An Integrated Approach to MaximizePersonality, WILEY INDIA, ISBN:13:9788126556397
3. Essentials of Effective Communication, Ludlow and Panthon; Prentice Hall of India.

REFERENCE BOOKS:

1. Indrajit Bhattacharya, ―An Approach to Communication Skills‖, Delhi, Dhanpat Rai, 2008.
2. Seven Spiritual Laws of Success - Deepak Chopra
3. Simon Sweeney, ―English for Business Communication‖, Cambridge University Press, ISBN13:978-0521754507.

DS2207- Employability Enhancement Skills-II

TEACHING SCHEME	EXAMINATION SCHEME
Theory : 2 Hrs. / Week	MSE:--
Tutorial:--	ISE/CA:25
Practical: --	ESE:--
Credit: 2	

Prerequisite:

Course Objectives:
- Understand ethical principles and workplace conduct.
- Develop strong work ethics and positive attitudes.
- Adapt to changing work environments and embrace challenges.

Course Outcomes:

Upon successful completion of this course, the student will be able to –
- Solve problems creatively and make informed decisions.
- Collaborate effectively with diverse teams and build strong relationships.
- Utilize digital tools and technologies proficiently.
- Build a strong professional network through effective networking strategies.
- Set realistic career goals and develop a comprehensive career plan.

Unit No.	Unit Name	No. of Lectures
1	**Grammar and Comprehension** English sentences and phrases, Analysis of complex sentences, Transformation of sentences, Paragraph writing, Story writing, Reproduction of a story, Letter writing, précis writing, Paraphrasing and e-mail writing.	5
2	**Professional Ethics** - Ethical principles in engineering - Professional codes of conduct - Intellectual property rights - Environmental ethics Social responsibility	5
3	**Skills for interviews** Interviews- types of interviews, preparatory steps for job interviews, interview skill tips, Group discussion- importance of group discussion, types of group discussion, difference between group discussion, panel discussion and debate, personality traits evaluated in group discussions, tips for successful participation in group discussion, Listening skills- virtues of listening, fundamentals of good listening, Non-verbal communication-body movement, physical appearance, verbal sounds, closeness, time	5

	Time Management and Productivity	5
4	- Time management techniques (time blocking, prioritization, etc.) - Stress management and work-life balance - Productivity tools and techniques - Goal setting and planning	
	Problem Solving Techniques	5

5	Problem solving model: 1. Define the problem, 2. Gather information, 3. Identify various
	      solution, 4. Evaluate alternatives, 5. Take actions, 6. Evaluate the
	      actions. Problem solving skills: 1. Communicate. 2. Brain storming,
	      3. Learn from mistakes	

6	**Career Development** - Resume writing and CV preparation - Cover letter writing - Job search strategies - Interview skills - Networking and building professional relationships	5

 TEXT BOOKS:
1. R. Gajendra Singh Chauhan, Sangeeta Sharma, "Soft Skills- An integrated approach
to maximize personality", ISBN: 987-81-265-5639-7, First Edition 2016, Wiley.
2. Wren and Martin, "English grammar and Composition", S. Chand publications.
3. R. S. Aggarwal, "A modern approach to verbal reasoning", S. Chand publications.

REFERENCE BOOKS:
1. Philip Carter, "The Complete Book Of Intelligence Test", John Willey & Sons Ltd.
2. Philip Carter, Ken Russell, "Succeed at IQ test", Kogan Page
3. Eugene Ehrlich, Daniel Murphy, "Schaum's Outline of English Grammar", McGraw
Hills.
4. David F. Beer, David A. McMurrey, "A Guide to Writing as an Engineer", ISBN :
978-1-118-30027-5 4th Edition, 2014, Wiley.

DS2208-Fundamentals of Data Science Lab

TEACHING SCHEME	EXAMINATION SCHEME
Practical: 2 Hrs. / Week	MSE:--
Tutorial:--	ISE/CA:50
Practical : --	ESE:25
Credits:01	

Course Objectives

    1. To provide the students with the basic knowledge of Data Science.
    2. To make the students develop solutions using Data Science tools.
    3. To introduce them to Python packages and their usability.

Course Outcomes

Upon successful completion of this course, the students will be able to :
1. Summarize the basics of data science and its process.
2. Construct solution to a given problem using knowledge of tools for Data Science.
 3. Build a solution to a given problem using NumPy package.
4. Explain functions of Python libraries.

Minimum of 10 Experiments to be performed from the list given below.

Experiment List

1. Study assignment n Data Science Process.
2. Implementation of data manipulation using Excel.
3. Implementation o Data Visualization using Excel.
4. Study assignment on Kaggle.
5. Implementation of Array operations using Numpy.
6. Implementation of universal function in Numpy.
7. Implementation of data Operation in Pandas.
8. Implementation of dataset Operations in Pandas.
9. Implementations of Different graphs in Matplot lib.
10. Implementations of Different chart, plots in Matplotlib.
11. Implementations of Histogram in Matplotlib.
12. Implementation of data preprocessing on dataset in Kaggle

TEXT BOOKS:

1. Davy Cielen,ArnoD.B.Meysman,MohamedAli,"IntroducingDataScience",Manning
Publications.[Unit 1 and 2]
2. JakeVanderPlas,"PythonDataScienceHandbook:EssentialToolsforWorkingwithData",

O'REILLY Publication.[Unit 3,4,5]

3. DR.AmarSahay,"EssentialsofDataScienceandAnalytics",O'REILLYPublication. [Unit
1 and 3]

REFERENCE BOOKS:

1. Data Science from Scratch: First Principles with Python, O" Reilly Media, 2015. Glenn J. Myatt
John, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining,
Wiley Publishers, 2000.

VSEC
DS2209-Python for Data Science Lab

Practical: 2 Hrs. / Week	**MSE:--**
Tutorial:--	**ISE/CA:25**
Practical :--	**ESE:25**
Credit:01	

Course Objectives:
1. To understand Python programming language
2. To program simple algorithms for Data Science applications
3. To Understand different libraries used in Data Science
4. To apply Python to solve some problems in Data Science.

Course Outcomes:
 Upon successful completion of this course, the student will be able to –
 1. Identify the need for data science and solve basic problems using Python built-in data types and their methods.
 2. Design an application with user-defined modules and packages using OOP concept
 3. Employ efficient storage and data operations using NumPy arrays.
 4. Apply powerful data manipulations using Pandas.
 5. Do data preprocessing and visualization using Pandas

Minimum of 10 Experiments to be performed from the list given below.

Experiment List

1.	Program to demonstrate data types and their Methods.
2.	Program to demonstrate Looping- Loop Control statement.
3.	Program to demonstrate User defined functions.
4.	Program to demonstrate Files: File manipulations.
5.	Program to demonstrate Exception Handling.
6.	Program to demonstrate Class & Objects and Inheritance.
7.	Program to demonstrate to use NumPy.
8.	Program to demonstrate to use pandas Data Structures.
9.	Program to demonstrate to use SciPy Library.
10.	Program to demonstrate String Manipulation.
11.	Program to demonstrate Data processing.
12.	Program to demonstrate Plotting with pandas.

TEXT BOOKS:
1. Y. Daniel Liang, "Introduction to Programming using Python", Pearson,2012
2. Data Analytics using Python ,Bharti Motwani,Wiley Publications
3. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython",
O'Reilly, 2nd Edition,2018.
4. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data",
O'Reilly, 2017

REFERENCE BOOKS:
1. Wesley J. Chun, "Core Python Programming", Prentice Hall,2006.
2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2009.

DS2210-Mini Project Lab

TEACHING SCHEME	EXAMINATION SCHEME
Theory:--	MSE:--
Tutorial:--	ISE/CA:25
Practical: 2 Hrs. / Week	ESE:25
Credit 01	

Pre-requisites: Knowledge of software engineering and C/C++

Course Objectives:
1. To expose the students to solve the real world problems.
2. To utilize the techniques. Skills and modern Engineering tools for building the project.
3. To follow the methods and tasks as per SDLC Approach

Course Outcomes:
Upon successful completion of this course, the student will be able to –

1. Define the problem statement.
2. Organize, Plan and prepare the detailed project activities.
3. Construct Flowchart, System Architecture based on the project description
4. Implement the solution for their problem.

Platform: - C, C++

Course Contents/Description: -

The Mini Project should be undertaken preferably by a group of 3-4 students who will jointly work together and implement the project. The Mini Project topic should be based on theany one subject concept that students have studied for their Academic Year. The group will select the project with the approval of the guide and submit the name of the project with a synopsis of theproposed work not more than 02 to 03 pages. In the Synopsis they have to state Flowchart, Usage of the logic, algorithm, functions and suitable data structure for implementing the solution. They have to implement project using C, C++ languages.

Year and Semester	Second Year B. Tech - Semester IV (Common to all branches of Engineering)				
Course Category	Basic Science Courses (BSC)				
Title of Course	**Environmental Science**			Contact Hrs/Week	Credits
Teaching Scheme	L	T	P		
	02	--	--	02	Audit
Examination Scheme	MSE	ISE/CA	ESE	Total	
	30	10	60	100	

CourseObjectives: Theobjectivesofthecourseisto

1. Understand the scope & multidisciplinary nature of Environmental Studies.
2. Get acquainted with the problems associated with natural resources and their conservation.
3. Familiarize the environmental & social problems with global concern.
4. Recognize the importance of Biodiversity with respect to Western Ghats.

CourseOutcomes:

COs	Attheendofsuccessfulcompletionofthecourse,thestudentwillbeable to	BloomsTaxonomy
CO1	Understand the importance of Environmental Studies and recognize significance of ecosystem.	II
CO2	Classify the values of natural resources with associated problems for sustainable lifestyles.	II
CO3	Describe the social and global environmental issues	II
CO4	Make aware of Pollution issues with its mitigation measures.	II
CO5	Familiarize the basics of Biodiversity and concerned issues in the context of Western Ghats.	II
CO6	Acquaint with the role of environmental laws and regulations in conservation efforts.	I

SYLLABUS

Unit No	Content	Hours
	Nature of Environmental Studies and Importance of ecosystems.	
Unit1	• Definition, scope and importance. • Multidisciplinary nature of environmental studies • Need for public awareness. **Ecosystem** • Concept of an ecosystem. • Structure and function of an ecosystem. • Producers, consumers and decomposers. • Food chains, food webs and ecological pyramids • Introduction, types, characteristics features, structure and function of the following ecosystem a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) • Degradation of the ecosystems and it's impacts.	06Hrs
	Natural Resources and Associated Problems.	
Unit2	• Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. • Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. • Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. • Food resources: World food problem, changes caused by agriculture, effect of modern agriculture, fertilizer-pesticide problems. • Energy resources: Growing energy needs, renewable and non- renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy. • Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of individuals in conservation of natural resources. Equitable use of resources for sustainable lifestyles.	06Hrs

Unit3	**Social Issues and the Environment**		
	• Human population growth and impact on environment. • Environmental ethics: Role of Indian religious traditions and culture in conservation of the environment. • Environmental movements- Chipko Movement, Appiko Movement, Silent Valley Movement. • Resettlement and rehabilitation of people; its problems and concerns. • Water conservation, rain water harvesting. • Disaster management: floods, earthquake, cyclone, tsunami and landslides, Case studies.		**04Hrs**
Unit4	**Environmental Pollution**		
	• Definition: Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Global warming, acid rain, ozone layer depletion. • Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Solid waste management, control& rules, • Role of an individual in prevention of pollution		**04Hrs**
Unit5	**Biodiversity and its conservation:**		
	• Introduction- Definition: genetic, species and ecosystem diversity. • Bio-geographical classification of India. • Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. • India as a mega- diversity nation. • Western Ghat as a biodiversity region. Hot-spots of biodiversity. • Threats to biodiversity: habitat loss, poaching of wildlife, man- wildlife conflicts, • Conservation of biodiversity: In-situ and Ex- situ conservation of biodiversity.		**04Hrs**
Unit6	**Environmental Protection-Policies and practices**		
	• Environment Protection Act. • Air (Prevention and Control of Pollution) Act. • Water (Prevention and control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act • National and International Conventions and agreements on environment.		**04Hrs**

Field work: (Field work is equal to 4 lectures)   **10 marks**

Note - The ISE/CA is carried out through the Field work and Report writing.

- Visit to a local area to document environmental assets river/ forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

References:

ReferenceBooks	
1	Raut P.D., Environmental Studies, Shivaji University Press, 2021
2	Gleick, H.,1993, Water in crisis, Pacific Institute for studies in Dev., Environment& Security. Stockholm Env. Institute. Oxford Univ. Press 473p
3	Hawkins R.e., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
4	Heywood, V.H.& Watson, R.T.1995, Global Biodiversity Assessment, Cambridge Univ. Press 1140p.
5	Jadhav, H.&Bhosale, V.M.1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi 284p.
6	McKinney, M.L.& School. R.M.1196, Environmental Science Systems & Solutions, Web enhanced edition, 639p
7	Mhaskar A.K., Master Hazardous, Techno-Science Publications (TB)

DS2212-Computer Maintenance Technology

TEACHING SCHEME	EXAMINATION SCHEME
Theory :--	MSE:--
Tutorial:--	ISE/CA:50
Practical: 2 Hrs. / Week	ESE: --
Credit: 1	

Pre requisite: Basic Computer Knowledge

Course Objective:
1. Gain in-depth knowledge of computer hardware components, their functions, and troubleshooting techniques.
2. Learn to install, configure, and troubleshoot various software applications.
3. Adhere to ethical standards and maintain confidentiality of customer information.

Course Outcome:
1. Identify, describe, and troubleshoot common computer hardware components.
2. Install, configure, and troubleshoot various operating systems.
3. Implement and maintain basic network infrastructure and troubleshoot network connectivity issues.
4. Install, configure, and troubleshoot various software applications.
5. Implement basic data security measures, including data backup, recovery, and virus protection.

Note: Minimum 10 experiments should conduct from following list

Experiment List
1. Desktop/laptop/server type identification and its specification
2. Identification and cleaning of Components.
3. Preventive Maintenance of PC
4. Perform Internal socket connections
5. Perform BIOS settings
6. Installation of Windows Operating System
7. Installation of Unix family Operating System
8. Peripheral devices cleaning
9. Installation of local and Network printer
10. Share devices, files and folders
11. Installation of scanner
12. Set Input/output devices
13. Connect devices to external port
14. Networking devices connection
15. Fiber optic cable construction
16. Connection of Switches/Hub
17. Setup wired network environment
18. Setup wireless I/O devices
19. Fault diagnostics
20.Component replacement

BOOKS:
1. ISBN: 9788183335096 Authors: Mark Edward Soper, Rights: Worldwide, Publishing Date: January 2017

REFERENCES:
1. https://www.youtube.com/watch?v=33fjR9wP0Qo
2. https://www.youtube.com/watch?v=ZJKk5iNFjIU

Equivalence of Subjects between CBCS and NEP for

S.Y. B. Tech (Sem-III & IV)

Name of Programme:CSE(DS)

Class: S. Y. B. Tech Semester- III

Sr. No	Name of Subjects in existing CBCS 2018 onwards pattern (Add all subjects)	Name of Subjects in NEP pattern	Reason	Remark
1	BSC - DS301 Applied Mathematics	Statistic for Data Science	**Related** (Mathematics to Statistics)	Mathematics fundamentals are essential for statistics, but focus differs.
2	PCC- DS302 Discrete Mathematics & Structures	Software Engineering	**Not directly equivalent** (Different focus)	Discrete Math is theoretical, while Software Engineering focuses on development processes.
3	PCC- DS303 Data Structures	Operating System	**Not equivalent** (Different domains)	Data Structures and OS are separate domains in computing.
4	PCC- DS304 Computer Networks	Object Oriented Programming	**Not equivalent** (Networks vs. OOP)	Computer Networks focus on communication, whereas OOP is

				about programming paradigms.
5	PCC- DS305 Microprocessors and Microcontrollers	Multi-disciplinary Minor – C Programming	**Partially related** (C is used in embedded systems)	C is used in embedded systems but does not fully cover microprocessors.
6	PCC- DS306 C Programming	Open Elective-01 (Programming for Everyone, Computer Graphics, Multimedia)	**Partially related** (Programming focus)	C Programming is included, but electives provide broader choices.
7	HM- DS307 Soft Skills	Employability Enhancement Skills-I	**Equivalent** (Soft skills improvement)	Both focus on improving communication and professional skills.
8	-	Data Structures Using C	**Equivalent to DS303 (Data Structures)**	The same subject is reintroduced as a lab-based course.
9	-	Cyber Laws	**New addition** (No equivalent in CBCS)	Introduces legal aspects of cybersecurity.
10	-	Open Elective-01 Lab	**New addition** (No equivalent in CBCS)	Lab component for elective subjects.

Class: S. Y. B. Tech   Semester- IV

Sr. No	Name of Subjects in existing CBCS 2018 onwards pattern (Add all subjects)	Name of Subjects in NEP pattern	Reason	Remark
1	PCC- DS406 Python for Data Science	Fundamental Of Data Science	**Partially related** (Python is a part of Data Science)	Python is a key component of Data Science but the scope may differ.
2	PCC- DS402 Computer Networks Protocols	Computer Networks	**Equivalent**	Both subjects cover networking concepts.
3	PCC- DS403 Statistic for Data Science	Discrete Mathematics & Structure	**Not equivalent** (Statistics vs. Discrete Math)	Statistics and Discrete Math have different applications.
4	PCC- DS404 Operating Systems	Multi-disciplinary Minor-02 (Python Programming)	**Not equivalent** (OS vs. Python)	OS deals with system management, whereas Python is a programming language.
5	PCC- DS405 Software Engineering	Open Elective-02 (E-Commerce & Digital Marketing, Social and Ethical Issues in AI)	**Not directly equivalent**	Software Engineering is a core subject, while electives cover different domains.
6	PCC-DS401 Automata Theory	Soft Skills	**Not equivalent** (Theory vs. Communication skills)	Automata Theory is a technical subject,

				whereas Soft Skills focus on communication.
7	PW- DS407 Mini Project	Employability Enhancement Skills-II	**Partially related** (Project-based skills)	Mini Project may contribute to employability skills, but EES-II includes broader skill development.
8	MC-DS408 Environmental Studies	Fundamental Of Data Science Lab	**Not equivalent** (Environment vs. Data Science Lab)	Environmental Studies is unrelated to Data Science.
9	-	Python for Data Science Lab	**Equivalent to PCC- DS406 Lab**	Lab component of Python for Data Science.
10	-	Mini Project Lab	**Equivalent to PW- DS407 Lab**	Lab component of the Mini Project.
11	-	Environmental Science	**Equivalent to MC-DS408**	Same as Environmental Studies in CBCS.
12	-	Computer Maintenance Technology	**New addition** (No equivalent in CBCS)	This is a new subject added in NEP.