SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR – 440013

An Autonomous College affiliated to
Rashtrasant Tukadoji Maharaj Nagpur University,
Nagpur, Maharashtra (INDIA)

PROGRAMME SCHEME & SYLLABI
2020 – 2021

B. E. COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

Published By

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Scheme for B. E. Computer Science and Engineering (Data Science)

Semester - I

Sr. No.	Category	Course code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
1.	BSC	CHT152	Chemistry	3	1	0	4	40	60	100	03
2.	BSC	CHP152	Chemistry Lab	0	0	3	1.5	25	25	50	-
3.	BSC	MAT152	Differential Equation, Linear Algebra, Statistics & Probability	3	0	0	3	40	60	100	03
4.	PCC	CDT101	Programming for Problem Solving	4	0	0	4	40	60	100	03
5.	PCC	CDP101	Programming for Problem Solving Lab	0	0	2	1	25	25	50	-
6.	ESC	IDT151	Creativity, Innovation & Design Thinking	1	0	0	1	20	30	50	1.5
7.	ESC	CDT102	Computer Workshop	1	0	0	1	20	30	50	1.5
8.	ESC	CDP102	Computer Workshop Lab	0	0	2	1	25	25	50	-
9.	HSMC	HUT151	English	2	0	0	2	40	60	100	03
10.	HSMC	HUP151	English Lab	0	0	2	1	25	25	50	-
			TOTAL	**14**	**1**	**9**	**19.5**			**700**	

Semester - II

Sr. No.	Category	Course code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
1.	BSC	PHT156	Semiconductor Physics	3	1	0	4	40	60	100	03
2.	BSC	PHP156	Semiconductor Physics Lab	0	0	3	1.5	25	25	50	-
3.	BSC	MAT151	Calculus	3	1	0	4	40	60	100	03
4.	BSC	MAP151	Computational Mathematics Lab	0	0	2	1	25	25	50	-
5.	ESC	CDT103	Digital Electronics	3	0	0	3	40	60	100	03
6.	ESC	CDP103	Digital Electronics Lab	0	0	2	1	25	25	50	-
7.	PCC	CDT104	Object Oriented Programming	3	0	0	3	40	60	100	03
8.	PCC	CDP104	Object Oriented Programming Lab	0	0	2	1	25	25	50	-
9.	HSMC	HUT152	Constitution of India	2	0	0	0	-	-	-	-
10.	MC	PEP151	Yoga / Sports	0	0	2	0	-	-	-	-
			TOTAL	**14**	**2**	**11**	**18.5**			**600**	

Semester-III

Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
1.	BSC	MAT272	Mathematics for Data Science	2	1	0	3	40	60	100	03 Hrs
2.	PCC	CDT201	Data Structure and Algorithms	3	0	0	3	40	60	100	03 Hrs
3.	PCC	CDP201	Data Structure and Algorithms Lab	0	0	4	2	25	25	50	-
4.	PCC	CDT202	Computer Organization and Architecture	3	0	0	3	40	60	100	03 Hrs
5.	PCC	CDP203	Advanced Object Oriented Programming Lab	0	0	4	2	25	25	50	-
6.	PCC	CDP204	Technical Skill Enhancement Lab	0	0	2	1	25	25	50	-
7.	PCC	CDP205	Statistical Programming Lab	0	0	2	1	25	25	50	-
8.	HSMC	HUT256	Indian Traditional Knowledge	2	0	0	0	-	-	-	-
9.	HSMC	HUT253	Business Communications	3	0	0	3	40	60	100	03 Hrs
10.	HSMC	HUT257	Cyber Laws & Ethics in IT	2	0	0	2	40	60	100	03 Hrs
			TOTAL	**15**	**1**	**12**	**20**			**700**	-

Semester-IV

Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
1.	PCC	CDT206	Artificial Intelligence	3	0	0	3	40	60	100	03 Hrs
2.	PCC	CDT207	Operating Systems	3	0	0	3	40	60	100	03 Hrs
3.	PCC	CDP207	Operating Systems Lab	0	0	4	2	25	25	50	-
4.	PCC	CDT208	Database Management Systems	3	0	0	3	40	60	100	03 Hrs
5.	PCC	CDP208	Database Management Systems Lab	0	0	4	2	25	25	50	-
6.	PCC	CDT209	Theory of Computation	3	0	0	3	40	60	100	03 Hrs
7.	PCC	CDT210	Computer Network	3	0	0	3	40	60	100	03 Hrs
8.	PCC	CDP211	Data Handling and Visualization Lab	0	0	4	2	25	25	50	-
9.	OEC		Open Elective - 1	3	0	0	3	40	60	100	03 Hrs
10.	MC	CHT252	Environmental Sciences	2	0	0	0	-	-	-	-
			TOTAL	**20**	**0**	**12**	**24**			**750**	-

	Recommended Course from MOOC
1	Model Thinking

Semester-V

Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)
				L	T	P		Conti-nuous Evaluation	End Sem Exam	Total	
1.	PCC	CDT301	Machine Learning	3	0	0	3	40	60	100	03 Hrs
2.	PCC	CDP301	Machine Learning Lab	0	0	2	1	25	25	50	-
3.	PCC	CDT302	Information Security and Privacy	3	0	0	3	40	60	100	3Hrs
4.	PCC	CDP303	Programming Languages Lab	0	0	4	2	25	25	50	-
5.	PCC	CDT304	Compiler Design	3	0	0	3	40	60	100	03 Hrs
6.	PEC	CDT305	Program Elective - I	3	0	0	3	40	60	100	03 Hrs
7.	PEC	CDP305	Program Elective – I Lab	0	0	2	1	25	25	50	-
8.	PR	CDP306	Project Based Learning - I	0	0	6	3	25	25	50	-
9.	OEC		Open Elective-II / MOOC	3	0	0	3	40	60	100	03 Hrs
			TOTAL	**15**	**0**	**14**	**22**			**700**	-

Course Code	Program Elective – I
CDT305-1	Digital Image Processing
CDT305-2	Language Processor
CDT305-3	Design Patterns
CDT305-4	Health Informatics

Course Code	Program Elective – I Lab
CDP305-1	Digital Image Processing Lab
CDP305-2	Language Processor Lab
CDP305-3	Design Patterns Lab
CDP305-4	Health Informatics Lab

	Recommended course from MOOC
1	Android Programming

Semester-VI

Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)
				L	T	P		Conti-nuous Evaluation	End Sem Exam	Total	
1.	PCC	CDT307	Design and Analysis of Algorithm	3	0	0	3	40	60	100	3Hrs
2.	PCC	CDT308	Deep Learning - I	3	0	0	3	40	60	100	3Hrs
3.	PCC	CDP308	Deep Learning – I Lab	0	0	4	2	25	25	50	-
4.	PEC	CDT309	Program Elective - II	3	0	0	3	40	60	100	3Hrs
5.	PEC	CDP309	Program Elective – II Lab	0	0	2	1	25	25	50	-
6.	PCC	CDT310	Software Engineering and Testing Methodologies	3	0	0	3	40	60	100	3Hrs
7.	PCC	CDP310	Software Engineering and Testing Methodologies Lab	0	0	2	1	25	25	50	-
8.	PR	CDP311	Project Based Learning - II	0	0	6	3	25	25	50	-
9.	OEC		Open Elective-III / MOOC	3	0	0	3	40	60	100	3Hrs
			TOTAL	15	0	14	22			700	-

Course Code	Program Elective – II
CDT309-1	Computer Vision
CDT309-2	Natural Language Processing
CDT309-3	IOT systems and cloud
CDT309-4	Data Science for Healthcare

Course Code	Program Elective – II Lab
CDP309-1	Computer Vision Lab
CDP309-2	Natural Language Processing Lab
CDP309-3	IOT systems and cloud Lab
CDP309-4	Data Science for Healthcare Lab

	Recommended course from MOOC
1	Business Analytics

Semester-VII

Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
1.	PCC	CDT401	Deep Learning - II	3	0	0	3	40	60	100	3Hrs
2.	PCC	CDP401	Deep Learning – II Lab	0	0	4	2	25	25	50	--
3.	PCC	CDT402	Large Scale Data Analytics	3	0	0	3	40	60	100	3Hrs
4.	PEC	CDT403	Program Elective-III	3	0	0	3	40	60	100	3Hrs
5.	PEC	CDP403	Program Elective-III Lab	0	0	2	1	25	25	50	--
6.	PEC	CDT404	Program Elective-IV	3	0	0	3	40	60	100	3Hrs
7.	PEC	CDP404	Program Elective-IV Lab	0	0	2	1	25	25	50	--
8.	OEC		Open Elective-IV / MOOC	3	0	0	3	40	60	100	3Hrs
9.	PR	CDP405	Project Based Learning – III	0	0	6	3	40	60	100	3Hrs
			TOTAL	**15**	**0**	**14**	**22**			**750**	-

Course Code	Program Elective – III	Course Code	Program Elective – IV
CDT403-1	Convolutional Neural Networks for Visual Recognition	CDT404-1	Graph Mining
CDT403-2	Recurrent Neural Networks for NLP	CDT404-2	Data Science for NLP
CDT403-3	Dockers and Kubernetes	CDT404-3	High Performance Computing

Course Code	Program Elective – III Lab	Course Code	Program Elective – IV Lab
CDP403-1	Convolutional Neural Networks for Visual Recognition Lab	CDP404-1	Graph Mining Lab
CDP403-2	Recurrent Neural Networks for NLP Lab	CDP404-2	Data Science for NLP Lab
CDP403-3	Dockers and Kubernetes Lab	CDP404-3	High Performance Computing Lab

	Recommended course from MOOC
1	Human Computer Interaction
2	Robotics

Semester-VIII

Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
1.	PEC	CDT406	Program Elective-V	3	0	0	3	40	60	100	3Hrs
2.	PEC	CDT407	Program Elective-VI	3	0	0	3	40	60	100	3Hrs
3.	PR	CDP408	Project Based Learning - IV	0	0	12	6	50	50	100	-
			OR								
4.	PR	CDP409	Industry Internship	-	-	-	12	150	150	300	-
			TOTAL	6	0	12	12				

Course Code	Program Elective – V	Course Code	Program Elective – VI
CDT406-1	Information Retrieval	CDT407-1	Time Series Analysis
CDT406-2	Advanced Multi-Core Systems	CDT407-2	Social and Information Network Analysis
CDT406-3	Mining Massive Data Sets	CDT407-3	Biomedical Image and Signal Processing

Total Credits = 160

Syllabus for Semester I, BE Computer Science & Engineering (Data Science)

Course Code : CHT152 **Course : Chemistry**

L: 3 Hrs, T: 1 Hr, P: 0 Hr, Per Week **Total Credits : 4**

Course Outcomes

After the successful completion of the course, students shall be able to

- Predict the properties and interactions of chemical substances by understanding their composition at the atomic level.
- Conversant in applying unique properties of nano-materials to solve challenges in our life.
- Explain the differences in the mechanical behavior of engineering materials based upon bond type, structure, composition, and processing.
- Study chemical kinetics using concepts of computational chemistry.
- Discuss how spectroscopic methods are used for qualitative and quantitative analyses.
- Analyse impurities present in the water and suggest the methodology for its removal

Syllabus

Unit 1: Solid State Chemistry (7 Hours)

Bondings in atoms: Primary bonding: ionic, covalent, metallic. Secondary bonding: dipole-dipole, induced dipole-induced dipole, London dispersion/van der Waals, hydrogen. Shapes of molecules: hybridization, LCAO-MO, VSEPR theory.

Electronic material: Band theory: metals, insulators, and semiconductors. Band gaps, doping. Silicon wafer production.

Unit 2: Nano-material-I(7 Hours)

Basics of Nanochemistry: Defination of Nano, Scientific revolution-Atomic Structure and atomic size, emergence and challengs of nanoscience and nanotechnology, carbon age-new form of carbon (CNT to Graphene), One dimensional, Two dimensional and Three dimensional nanostructured materials, mechanical-physical-chemical properties.

Application of Nanomaterial: Molecular electronics and nanoelectronics, Nanotechnology for waste reduction and improved energy efficiency, Carbon Nanotubes for energy storage, Hydrogen Storage in Carbon Nanotubes, nanotechnology based water treatment strategies.

Unit 3: Advanced Materials: (7 hours)

Composite materials: Introduction, Classification: Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Carbon–Carbon Composites, Fiber- Reinforced Composites and Applications.

Reinforcements: Fibres- Glass, Kevlar, Carbon, Silicon Carbide, And Born Carbide Fibres.

Industrial Polymer: Thermoplastics, Thermosetting Plastics, Polymers used in electronic industries, Piezo and pyroelectric polymers, Polymers in optical media data storage devices.

Unit 4: Computational Chemistry [6 Hours]

Rate of the reaction, Order and Molecularity of the reaction, Rate expression for Zero Order, First Order and Second Order Reactions, Effect of the temperature, Use of Mathematica for determining rate of the reaction, etc.

Unit 5: Material Characterization using different Spectroscopic Techniques [7 Hours]

Fundamentals of spectroscopy, Infrared Spectroscopy, Electronic Spectrocopy, Nuclear Magnetic Resonance Spectroscopy.

Fundamentals of X-Ray Diffractions (XRD), X-Ray Fluorescence (XRF) spectroscopy.

Unit 6: Water Technology [8 Hours]

Impurities in natural water, hardness and alkalinity, Disadvantages of hardness i. e. sludge and scale formation, softening of water using lime-soda, zeolite and ion-exchange method, advantages and limitations of these water softening processes, Desalination of water using Reverse Osmosis.

Text Books

1. J. Michael Hollas, Modern Spectroscopy, Fourth Edition, John Wiley and Sons, 2004.
2. William Kemp, Organic Spectroscopy, Third Edition, Palgrave Publication, 1991.
3. Bradley D. Fahlman, Materials Chemistry, Third Edition, Springer Nature, 2018.
4. Brian W. Pfennig, Principles of Inorganic Chemistry, John Wiley and Sons, 2015.
5. Steven S. Zumdahl, Donald J. DeCoste, Chemical Principles,Eighth Edition, Cengage Learning, 2017.
6. Catherine E. Housecroft and Edwin C. Constable, Chemistry: An Introduction to Organic, Inorganic and Physical Chemistry, Third Edition, Pearson Education Limited, 2006.
7. Michael J. Moran and Howard N. Shapiro, Fundamentals of Engineering Thermodynamics, Fifth Edition, John Wiley and Sons, 2006.
8. Donald L. Pavia, Gary M. Lampman, George S. Kriz, and James R. Vyvyan, Introduction to Spectroscopy, Fifth Edition, Cengage Learning, 2009.
9. C. N. R. Rao, A. Muller and A. K. Cheetham, The Chemistry of Nanomaterials: Synthesis, Properties and Applications, Wiley-VCH, 2004.
10. P. C. Jain and Monica Jain, Engineering Chemistry, Dhanpat Rai Publication.
11. S. S. Dara, A Textbook ofEngineering Chemistry, S. Chand Publications.
12. J. D. Lee, Concise Inorganic Chemistry, Fourth Edition, Chapman and Hall Publications.

Syllabus for Semester I, BE Computer Science & Engineering (Data Science)

Course Code : CHP152 **Course : Chemistry Lab**

L: 0 Hrs, T: 0 Hr, P: 3 Hr, Per Week **Total Credits : 1.5**

Course Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.

The students will learn to:

- Estimate the amount of different impurities in water/waste water samples.
- Estimate rate constants of reactions and order of the reaction from concentration of reactants/products as a function of time and to validate adsorption isotherms.
- Measure molecular/system properties such as surface tension, viscosity of aqueous or other industrially important liquids/mixtures etc.
- Synthesize a polymer or drug molecule or nano-material.
- Use principle of spectroscopic techniques for structural determination.

List of Experiments: [Any Eight from the List]

[1] Preparation of different Solutions: Molar solution, Normal solution and percent solution and Determination of concentration.

[2] To find out types of alkalinity and estimation of their extent in the water sample.

[3] Estimation of temporary, permanent and total hardness present in the water sample using complexometric titration method.

[4] Spectroscopic/Colorimetric determine of wavelength of maximum absorption of chemical/biological compound in solution and determination of concentration using Lambert-Beer's Law.

[5] Determination of rate of the reaction of hydrolysis of ethyl acetate at room temperature and analysis of experimental data using Computational Software.

[6] To study chemical kinetics of peroxydisulphate and iodide ions reactions and to find out order of the reaction and analysis of experimental data using Computational Software.

[7] Synthesis of Nano-material/Polymer and its study.

[8] Determination of relative and kinematic viscosities of aqueous solutions of Poly-ethylene glycol (Polymeric Liquid) using Redwood Viscometer (type I or II) at different temperatures.

[9] To study effect of bondings of water molecules with electrolyte (NaCl/KCl) and non-electrolyte solute (Soap) in the solution through Surface Tension Determination.

[10] Study of ion-exchange column for removal of hardness in the water sample.

[11] Demonstrations of organic spectral techniques: IR, NMR.

[12] Demonstration of in-organic spectral techniques: XRD, XRF.

Text Books / Reference Books

(1) S. S. Dara, A Textbook on Experiments and Calculations in Engineering Chemistry, S. Chand Publications.

(2) J. B. Yadav, Advanced Practical Physical Chemistry, Krishna's Prakashan Media (P) Limited.

(3) A. J. Elias, Collection of Interesting General Chemistry Experiments, Universities Press Publications.

(4) V. K. Ahluwalia, S. Dhingra and A. Gulati, College Practical Chemistry, Universities Press Publications.

(5) Ashutosh Kar , Advanced Practical Medicinal Chemistry, New Age International Publisher.

Syllabus for Semester I, BE Computer Science & Engineering (Data Science)

Course Code : MAT 152 **Course : Differential equations, Linear Algebra, Statistics & Probability**

L: 3Hrs., T: 0 Hrs., P: 0 Hrs., Per week **Total Credits: 03**

Course Objective

The objective of this course is to familiarize the prospective engineers with techniques in Ordinary differential equation, statistics, probability and Matrices.

It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Course Outcomes

On successful completion of the course, the students will learn:

1 . The effective mathematical tools for the solutions of ordinary differential equations that model physical processes.

2 . The essential tool of matrices in a comprehensive manner.

3 . The ideas of probability and various discrete and continuous probability distributions and the basic ideas of statistics including measures of central tendency, correlation and regression.

Syllabus

Module 1:First order ordinary differential equations(7 hours)

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree : equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Module 2: Ordinary differential equations of higher orders (8 hours)

Second order linear differential equations with constant and variable coefficients, method of variation of parameters, Cauchy-Euler equation.

Module 3:Basic Statistics: (7 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves, correlation and regression – Rank correlation, Multiple regression and correlation.

Module 4: Basic Probability: (8 hours)

Probability spaces, conditional probability, independence; Discrete random variables, Binomial distribution, Poisson distribution, Normal distribution. Relation between binomial, Poisson and Normal distributions.

Module 5: Matrices (10 hours)

Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigen values and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

Topics for Self Learning

Application of Differential Equations.

Textbooks / References

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Theory and Problems of probability and statistics : 2nded :J. R. Spiegal ,Schaum series
8. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune-411030 (India).
9. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

Syllabus for Semester I, BE Computer Science & Engineering (Data Science)

Course Code : CDT101 **Course : Programming for Problem Solving**

L: 4 Hrs, T: 0 Hr, P: 0 Hr, Per Week **Total Credits : 4**

Course Outcomes

On successful completion of course student will learn:

1. To formulate simple algorithms for arithmetic and logical problems, translate the algorithms to programs (in C language), test and execute the programs and correct syntax and logical errors.
2. To implement conditional branching, iteration and recursion, to decompose a problem into functions and synthesize a complete program using divide and conquer approach.
3. To use arrays, pointers, structures and I/O operations for the formulation of algorithms and programs.
4. To apply programming to solve matrix addition, multiplication problems and searching & sorting problems.

UNIT-I: Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm : Steps to solve logical and numerical problems. Representation of Algorithm: Flowchart / Pseudocode with examples. Arithmetic expressions and precedence

UNIT-II: C Programming Language

Introduction to C language: Keywords, Constant, Variable, Data types, Operators, Types of Statements, Preprocessor Directives, Decision Control Statement-if, if-else, Nested if-else statement, Switch case, Loops and Writing and evaluation of conditionals and consequent branching.

UNIT-III: Arrays and Basic Algorithms

Arrays: 1-D, 2-D, Character arrays and Strings. Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

UNIT-IV: Functions and Recursion

User defined and Library Functions, Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference. Recursion: As a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

UNIT-V: Pointers and Structures

Structures, Defining structures, Array of Structures, Introduction to pointers, Defining pointers, Pointer arithmetic, pointer operators, Use of Pointers in self-referential structures, notion of linked list (no implementation)

UNIT-VI: File handling

Streams in C, Types of Files, File Input/ Output Operations: Modes of file opening, Reading and writing the file, Closing the files, using fflush().

Text Books:

1. Programming in ANSI C : E. Balguruswami McGraw Hill
2. Mastering C: K. R. Venugopal and S. R. Prasad, Tata McGraw Hill

Reference Books:

Programming with C: Byron Gottfried, Schaums Outline Series.
2. Let Us C: Yashwant Kanetkar, BPB Publication

Syllabus for Semester I, BE Computer Science & Engineering (Data Science)

Course Code : CDP101 **Course : Programming for Problem Solving Lab**

L: 0 Hrs, T: 0 Hr, P: 2Hr, Per Week **Total Credits : 1**

Course Outcomes :

On successful completion of course student will be able to:

1. Understand the fundamentals of C programming and choose the loops and decision making statements to solve and execute the given problem.
2. Implement different Operations on arrays also design functions to solve the given problem using C programming.
3. Understand pointers, structures, unions and apply them to develop programs.
4. Implement file Operations in C programming for a given application.

Syllabus for Semester I, BE Computer Science & Engineering (Data Science)

Course Code: IDT151 **Course: Creativity, Innovation & Design Thinking**

L: 1 Hrs, T: 0 Hr, P: 0Hr, Per Week **Total Credits : 1**

Course Outcomes

1: Be familiar with processes and methods of creative problem solving

2: Enhance their creative and innovative thinking skills

3: Practice thinking creatively and innovative design and development

Detailed Topics

UNIT I. Introduction: Making a case for creativity, Creative thinking as a skill, Valuing diversity in thinking: Thinking preferences, Creativity styles, Creativity in problem solving

UNIT 2. Pattern Breaking: Thinking differently , Lateral thinking, Mind stimulation: games, brain-twisters and puzzles, Idea-collection processes, Brainstorming/Brainwriting, The SCAMPER methods, Metaphoric thinking, Outrageous thinking , Mapping thoughts, Other (new approaches)

UNIT 3. Using Math and Science, Systematic logical thinking, Using math concepts, Eight-Dimensional (8D) Approach to Ideation: Uniqueness, Dimensionality, Directionality, Consolidation, Segmentation, Modification, Similarity, Experimentation

UNIT4. Systematic Inventive Thinking: Systematic inventive thinking: The TRIZ methodology, Decision and Evaluation: Focused thinking framework, Six thinking hats , Ethical considerations

UNIT 5. Design for Innovation: Introduction to design for interaction, nine lessons for innovation, difference in creativity and innovation, Building blocks for innovation

UNIT 6.Intellectual Property: Introduction to intellectual property: Patents, Copyrights©, Trademarks ®, Trade Secret, Unfair Competition.

Reference Books and Text Book

1. Creative Problem Solving for Managers - Tony Proctor - Routledge Taylor & Francis Group
2. 101 Activities for Teaching creativity and Problem Solving - By Arthur B Vangundy - Pfeiffer
3. H. S. Fogler and S.E. LeBlanc, Strategies for Creative Problem Solving, Prentice Hall
4. E. Lumsdaine and M. Lumsdaine, Creative Problem Solving, McGraw Hill,
5. J. Goldenberg and D. Mazursky, Creativity in product innovation. Cambridge University Press, 2002.

Course Assignments for internal continuous assessment of 20 Marks (NO T1 and T2)

- Brain teasers (aka Puzzle Busters, to be solved individually)
- Cartoon captions (small teams)
- TRIZ, a systematic ideation method, reading (individual)
- Book readings and discussions (small teams)
- Small teams presentations on innovation: (1) innovative individual, (2) innovative company, (3) innovative movie / game, (4) sustainable innovation, (5) innovation in business, (6) innovation in art, (7) innovation in architecture, (8) innovative nation, (9) innovation in science, and (10) innovation in engineering.
- Large groups hands-on projects
- Eight-dimensional (8D) ideation method examples
- Large teams videos

Syllabus for Semester I, BE Computer Science & Engineering (Data Science)

Course Code : CDT102 **Course : Computer Workshop**

L: 1 Hrs, T: 0 Hr, P: 0Hr, Per Week **Total Credits : 1**

Course Objectives

1. Understand the fundamentals of writing Python code
2. Learn core Python coding concepts such as data types, variables and flow control structures
3. Discover how to work with lists and sequence data, dictionaries & write functions
4. Use Python to read and write files

Introduction to Python: Installation and working with Python, Variables, Basic Operators

Python Data Types: int , float, complex, User Input, Arithmetic Expressions ,Using Strings and Operations on Strings, Use of list and list slicing, Use of Tuples

Flow Control: Conditional blocks: if, else, elif, For Loops in Python: Loops with range, Strings, List and Dictionaries, While Loop

Python Functions: Defining a function, using a function

Python String, List and Dictionary manipulations

Files: Reading and Writing Files in Python, File Operations

Course Outcomes

On successful completion of the course, students will be able to:

1. Learn basic fundamentals of writing a python code
2. Understand Lists, Dictionaries in Python.'
3. Create Functions in Python
4. Handle Strings and Files in Python

Text Books

1. Python Programming Using Problem Solving Approach: Reema Thareja, Oxford University Press; First edition

Syllabus for Semester I, BE Computer Science & Engineering (Data Science)

Course Code : CDP102 **Course : Computer Workshop Lab**

L: 0 Hrs, T: 0 Hr, P: 2Hr, Per Week **Total Credits : 1**

Course Objectives

Throughout the course, students will be expected to learn Python Language basics to do the following:

1. Understand basic concepts of python code writing
2. Understand the basics of control flow operations, Use of Lists, Dictionaries
3. Develop program using functions
4. Develop programs for file handling

Syllabus

Programs based on:

1. Python Data Types
2. Flow Control
3. Functions
4. String
5. File handling

Course Outcomes

On successful completion of the course, students will be able to:

1. Write basic python code
2. Implement flow control in python
3. Implement functions in Python
4. Write python code for file handling

Syllabus for Semester I, BE Computer Science & Engineering (Data Science)

Course Code : HUT151 **Course : English**

L: 2 Hrs, T: 0 Hr, P: 0Hr, Per Week **Total Credits : 2**

Course Objectives

The main objective of the subject is to enhance the employability skills of engineering students as well as communication skills at work place. The sub-objectives are:

1. To develop vocabulary of students.
2. To orient students in basic writing skills.
3. To orient students in functional grammar.
4. To orient students in the process of effective writing.
5. To provide practice and improve students' oral communication skills.

Course Outcomes

1. Students will have good word power.
2. Students will acquire basic writing skills.
3. Students will understand functional grammar and its usage.
4. Students will organize and express their thoughts effectively through written communication.
5. Students will learn oral communication skills in order to handle themselves effectively in an interview and group discussion

SYLLABUS

1. Vocabulary Building

1.1. The concept of Word Formation

1.2. Root words from foreign languages and their use in English

1.3. Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives

1.4. Synonyms, Antonyms and standard abbreviations

2. Basic Writing Skills

2.1 Sentence Structures

2.2 Use of phrases and clauses in sentences

2.3 Importance of proper punctuation

2.4 Creating coherence

2.5 Organizing principles of paragraphs in documents

2.6 Techniques for writing precisely

3. Identifying Common Errors in Writing

3.1 Subject-verb agreement

3.2 Noun-pronoun agreement

3.3 Misplaced modifiers

3.4 Articles

3.5 Redundancies

3.6 Cliches

4. Nature and Style of sensible Writing

4.1 Describing

4.2 Defining

4.3 Classifying

4.4 Providing examples or evidence

5. Writing Practices

5.1 Comprehension

5.2 Precis Writing

5.3 Essay Writing

5.4 Letter Writing

5.5 Email Writing

6. Oral Communication

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations : Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

Books

1. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
2. Practical English Usage. Michael Swan. OUP. 1995.
3. Remedial English Grammar. F.T. Wood. Macmillan.2007
4. On Writing Well. William Zinsser. Harper Resource Book. 2001
5. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Syllabus for Semester I, BE Computer Science & Engineering (Data Science)

Course Code : HUP151 **Course : English Lab**

L: 0 Hrs, T: 0 Hr, P: 2Hr, Per Week **Total Credits : 1**

Course objective

1. To enhance competency of communication in English among learners.

Course outcomes

1. Students learn presentation and public speaking skills
2. Students learn to practice effective strategies for Personal Interview and Group Discussions
3. Students learn and effectively apply language skills – listening, speaking, reading and writing

List of Practical (2 hours each for each batch) based on unit 6 (oral communication).

1. Common Everyday Situations: Conversations and Dialogues
2. Pronunciation, Intonation , Stress, and Rhythm
3. Formal Presentations: Orientation
4. Formal Presentations : Practice Session
5. Interviews: Orientation
6. Interviews: Practice Session
7. Communication at Workplace: Group Discussion- Orientation
8. Communication at Workplace: Practice Session

Syllabus for Semester II, BE Computer Science & Engineering (Data Science)

Course Code : PHT156 **Course : Semiconductor Physics**

L: 3 Hrs, T: 1 Hr, P: 0Hr, Per Week **Total Credits : 4**

Course Objectives

1. To introduce ideas of quantum mechanics necessary to begin understanding semiconductor devices;

2. To familiarize prospective engineers with fundamental concepts of semiconductors and their interaction with light and resulting devices

Course Outcomes

After successful completion of the course students will

1. have an elementary understanding of quantum behaviour of electrons in solids;
2. have a grasp of band structure and its consequences for semiconductors;
3. should be able to use band structure to explain effects of doping,on the properties of junctions between semiconductors and metals;
4. have an elementary understanding of working of optoelectronic devices.

Module 1: Quantum Mechanics Introduction

Wave-particle duality, Heisenberg uncertainty relations, the quantum state wave function and its probability interpretation, Schrodinger's equation, Energies and wave functions of a single electron in one-dimensional infinite potentials: formulae, function graphs, number of bound states, tunneling, one Electron Atom, Periodic Table, Quantum confinement effects in nanosystems

Module 2: Electronic Materials

Free electron theory, Extension of idea of energy level splitting in molecules to bonding in solids, Energy bands in solids, Kronig-Penny model (to better demonstrate origin of band gaps), Band gap based classification of electronic materials: metals, semiconductors and insulators, E-k diagram, Direct and indirect bandgaps, Valence and conduction bands, Density of states, Fermi-Dirac statistics: Occupation probability of states, Fermi level, Effective mass.

Module 3: Intrinsic and Extrinsic Semiconductors

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier transport: diffusion and drift

Module 4: Non-Equilibrium Semiconductors

Carrier generation and recombination, Continuity equation, Ambipolar transport equation, Quasi-Fermi Energy levels, Excess Carrier Lifetime, Qualitative introduction to recombination mechanisms, Shorkley-Read-Hall Recombination, Surface Recombination

Module 5: Junction Physics

p-n junction, Zero applied bias, forward bias, reverse bias, Metal-semiconductor junction, Shottky barrier, Ideal junction properties, Ohmic contacts, ideal non-rectifying barrier, tunneling barrier, Heterojunctions, Nanostructures, Energy band diagram, two dimensional electron gas

Module 6: Light - Semiconductors Interaction

Optical absorption in semiconductors, Light emitting diodes, Principles, Device Structures, Materials, High Intensity LEDs, Characteristics, LASERS, Stimulated emission and photon amplification, Einstein Coefficients, Laser oscillation conditions, Laser diode, Solar Energy Spectrum, photovoltaic device principles, Solar Cells

Text Book(s)

Modules 1-5

1. Semiconductor Physics and Devices (Fourth Edition), Donald A. Neamen, McGraw-Hill 2012.

References

Modules 6

1. Online course: Semiconductor Optoelectronics by M. R. Shenoy on NPTEL
2. Optoelectronics and Photonics: Principles and Practices by S. O. Kasap, Prentice Hall 2001

Syllabus for Semester II, BE Computer Science & Engineering (Data Science)

Course Code : PHP156 **Course : Semiconductor Physics Lab**

L: 0 Hrs, T: 0 Hr, P: 3Hr, Per Week **Total Credits : 1.5**

Course Outcomes

The Physics Laboratory course will consist of experiments illustrating the principles of physics relevant to the study of science and engineering. Students will show that they have learnt laboratory skills that will enable them to properly acquire and analyze the data in physics laboratory and draw valid conclusions. At the end of the Course the students will learn to:

1. Develop skills to impart practical knowledge in real time.
2. Understand principle, concept, working and application of areas in physics and compare the results obtained with theoretical calculations.
3. Understand measurement technique, and report the results obtained through proper graph plotting and error analysis.

In addition to the demo experiments, the Lab turns will be utilized for performing the experiments based on the following lists as specific to Program

1. Error analysis and graph plotting
2. Energy gap of semiconductor/thermister
3. Study of Hall Effect
4. Parameter extraction from I-V characteristics of a PN junction diode
5. Parameter extraction from I-V characteristics of a zener diode
6. Study of diode rectification
7. Parameter extraction from I-V characteristics of a transistor in common-emitter configuration.

   Determination of Planck's constant
9. Determination of time constant of RC circuit
10. V-I Characteristics of Light Emitting Diodes
11. Study of a photodiode
12. Solar Cell (Photovoltaic cell)
13. Resistivity measurement by Four Probe method
14. Van der Pau and conventional techniques for resistivity measurement (LCR meter)
15. Study of R-C filters using C.R.O.
16. Data analysis using Mathematica.

A minimum of 8 experiments to be performed from the following list of experiments

Syllabus for Semester II, BE Computer Science & Engineering (Data Science)

Course Code : MAT151 **Course : Calculus**

L: 3 Hrs, T: 1 Hr, P: 0 Hr, Per Week **Total Credits : 4**

Course Objective

The objective of this course is to familiarize the prospective engineers with techniques in Calculus and multivariate analysis. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes

On successful completion of the course, the students will learn:

1. The fallouts of Mean Valve Theorems that is fundamental to application of analysis to Engineering problems , to deal with functions of several variables that are essential in most branches of engineering.
2. Basics of improper integrals ,Beta and Gamma functions , Curve Tracing , tool of power series and Fourier series for learning advanced Engineering Mathematics.
3. Multivariable Integral Calculus and Vector Calculus and their applications to Engineering problems.

Syllabus

Module 1: Calculus: (7 hours)

Rolle's theorem, Mean value theorems, Taylor's and Maclaurin series expansions; Indeterminate forms and L'Hospital's rule; radius of curvature (Cartesian form), evolutes and involutes

Module 2:Multivariable Calculus (Differentiation) (8 hours)

Limit, continuity and partial derivatives, Eulers Theorem, chain rule , total derivative, Jacobians, Maxima, minima and saddle points; Method of Lagrange multipliers.

Module 3 Calculus: (6 hours)

Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Tracing of curves(Cartesian form)

Module 4:Sequences and series: (7 hours)

Convergence of sequence and series, tests for convergence, power series, Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 5: Multivariable Calculus (Integration) (7 hours)

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by double integration Center of mass and Gravity (constant and variable densities).

Module 6 : Vector Calculus(7 hours)

Vector Differentiation, Directional derivatives, total derivative , Gradient, curl and divergence. Vector integration , Theorems of Green, Gauss and Stokes.

Topics for self learning

Maxima and minima for function of one variable, Geometrical interpretation of Partial Differentiation (Tangent plane and Normal line) , Applications of definite integrals to evaluate perimeter, area, surface areas and volumes of revolutions.

Text books / References

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
6. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune VidhyarthiGrihaPrakashan, Pune-411030 (India).

Syllabus for Semester II, BE Computer Science & Engineering (Data Science)

Course Code : MAP151 **Course: Computational Mathematics lab**

L: 0 Hrs, T: 0 Hr, P: 2Hr, Per Week **Total Credits : 1**

Course Outcomes

The Computational Mathematics Lab course will consist of experiments demonstrating the principles of mathematics relevant to the study of science and engineering. Students will show that they have learnt laboratory skills that will enable them to properly acquire and analyze the data in the lab and draw valid conclusions. At the end of the Course the students will learn to:

1. Develop skills to impart practical knowledge in real time.
2. Understand principle, concept, working and application of areas in mathematics and compare the results obtained with theoretical calculations.
3. Understand basics of mathematics, and report the results obtained through proper programming.

The Lab turns will be utilized for performing the experiments based on the following list:

1. Calculus
2. Ordinary Differential Equations
3. Statistics
4. Linear Algebra

Suggested References

1. Computational Mathematics Lab Manual written by the Teaching Faculty of Mathematics Department, RCOEM.

A minimum of 8 experiments to be performed based on the above list.

Syllabus for Semester II, BE Computer Science & Engineering (Data Science)

Course Code : CDT103 **Course : Digital Electronics**

L: 3 Hrs, T: 0 Hr, P: 0Hr, Per Week **Total Credits : 3**

Course Outcomes

After successful completion of this course, the student will be able to,

1. Understanding of various optimization techniques used to minimize and design digital circuits.
2. Analyze and design various combinational logic circuits.
3. Analyze and design various sequential circuits.
4. Design different microprocessor based components of computer system using combinational and sequential circuits.

Course Contents

UNIT-I- Basics of Digital Electronics

Motivation for digital systems: Logic and Boolean Algebra, Number Systems. Logic Gates & Truth Tables, Demorgan's law, Minimization of combinational circuits using Karnaugh maps upto five variable. Map manipulation-essential prime implicants, non essential prime implicants.

UNIT-II – Combinational Circuit Design

Design procedure: Multiplexers, Demultiplexer, Encoders ,Decoders ,Code Converters, Adders , Subtractor (Half ,Full), BCD Adder/ Subtractor , ripple and carry look-ahead addition.

UNIT-III- Sequential circuit Design-I

Storage elements, Flip-flops and latches: D, T, J/K, S/R flip-flops. Master Slave Conversion of one of type of F/F to another Sequential circuit. Analysis –Input equations, state table, analysis with J-K Flip flops. Sequential circuit Design, Design procedure, Designing with D & J-K Flip flop.

UNIT-IV-Sequential circuit Design-II

Counters, asynchronous and synchronous design using state and excitation tables. Registers & Shift registers.

UNIT-V- Programmable logic Design

Memory & Programmable logic Devices: RAM, Array of RAM IC's, Read only Memory, PLA, PAL, Flash Memories

UNIT-VI- Fundamental of Microprocessor

Introduction to μp 8085, Addressing modes, Instruction set, Programming of μp 8085.

Text Books

1. Morris Mano; Digital Logic Design; Fourth edition, McGraw Hill
2. R.P.Jain; Modern Digital Electronic; Fourth edition; Tata McGraw-Hill.
3. V.J.Vibhute; 8-Bit Microprocessor & Microcontrollers; fifth edition.

Reference Books

1. A. Anand Kumar; Fundamental of Digital Electronics; Second Edition, PHI
2. A.P.Godse; Digital circuit & design; Technical Publications; 2009.
3. Ramesh Gaonkar; 8 bit Microprocessor; CBS Publishers; 2011.

Syllabus for Semester II (BE CSE)
Data Science

Course Code : CDP103 **Course : Digital Electronics Lab**

L: 0 Hrs, T: 0 Hr, P: 2Hr, Per Week **Total Credits : 1**

Course Outcome

On Successful completion of course, students will be able to:

1. Use logic gates for designing digital circuits
2. Implement combinational circuits using VHDL
3. Implement sequential circuits using VHDL
4. Apply the knowledge gained for their project work based on the hardware digital circuits

Practicals based on above theory syllabus

Syllabus for Semester II, BE Computer Science & Engineering (Data Science)

Course Code : CDT104 **Course : Object Oriented Programming**

L: 3Hrs, T: 0 Hr, P: 0Hr, Per Week **Total Credits : 3**

Course Objectives

1. To make students understand Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections

2. Introduce students with fundamental concepts like exception handling, generics, multithreading and streams.

SYLLABUS

UNIT I

Features of Object Oriented Programming languages, Abstraction, Encapsulation, Inheritance, polymorphism and late binding.Concept of a class, Access control of members of a class, instantiating a class, constructor and method overloading.

UNIT II

Concept of inheritance, methods of derivation, use of super keyword and final keyword in inheritance, run time polymorphism, abstract classes and methods, Interface, implementation of interface, creating packages, importing packages, static and non-static members, Lambda Expressions Introduction, Block, Passing Lambda expression as Argument.

UNIT III

Exceptions, types of exception, use of try catch block, handling multiple exceptions, using finally, throw and throws clause, user defined exceptions, Introduction to streams, byte streams, character streams, file handling in Java, Serialization.

UNIT IV

Generics, generic class with two type parameter, bounded generics. Collection classes: Arraylist, LinkedList, Hashset, Treeset .

UNIT V

Multithreading: Java Thread models, creating thread using runnable interface and extending Thread, thread priorities, Thread Synchronization, InterThread communications.

UNIT VI

Introduction to Design Patterns, Need of Design Pattern, Classification of Design Patterns, Role of Design Pattern in Software design, Creational Patterns, Structural Design Patterns and Behavioral Patterns.

Course Outcomes

On successful completion of the course, students will be able to demonstrate

1. Understand the principles of object-oriented programming; create classes, instantiate objects and invoke methods.
2. Understand concept of generics and implement collection classes. Use exception handling mechanism.
3. Efficiently work with streams, use multithreading for solving classic synchronization problems. Perform java database connectivity and execute basic SQL commands.
4. Understand characteristics and need of Design Pattern in Software Design Process.

Text Books

1. Herbert Schildt; JAVA The Complete Reference; Ninth Edition, Tata McGraw- Hill Publishing Company Limited.
2. Design Patterns By Erich Gamma, Pearson Education.

Reference Books

1. Cay S. Horstmann and Gary Cornell; Core JAVA Volume-II Advanced Features; Eighth Edition; Prentice Hall, Sun Microsystems Press 2008.
2. Herbert Schildt and Dale Skrien; Java Fundamentals A Comprehensive Introduction; Tata McGraw- Hill Education Private Ltd 2013.

Syllabus for Semester II, BE Computer Science & Engineering (Data Science)

Course Code : CDP104 **Course : Object Oriented Programming Lab**

L: 0Hrs, T: 0 Hr, P: 2Hr, Per Week **Total Credits : 1**

Course Objectives

1. To develop ability of students to implement basic concepts and techniques of object oriented programming paradigm like encapsulation, inheritance, polymorphism, exception handling.
2. Develop solution to problems using collection classes, generics, streams, multithreading.

SYLLABUS

Experiments based on above Syllabus.

Course Outcomes:

On completion of the course the student will be able to

1. Design solution to problems using concepts of object oriented programming like classes, objects, inheritance with proper exception handling.
2. Use collection classes, generic classes to design programs and perform database connectivity.
3. Implement programs based on streams and multithreading.

Syllabus for Semester II, BE Computer Science & Engineering (Data Science)

Course Code : HUT152 **Course : Constitution of India**

L: 2 Hrs, T: 0 Hr, P: 0Hr, Per Week **Total Credits : 0**

Course outcome

1. Students will understand the role of constitution in democratic India
2. Students will be responsible students by knowing their fundamental rights and duties
3. Students will develop better understanding of democratic functions of the government of India
4. Students will form better understanding of system of governance for effective participation

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the Fundamental Rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Union Executive: structure, functions
10. Judiciary: Structure, role with special reference to PIL, writ petitions, strengthening of democracy & social Justice
11. Amendment of the Constitutional Powers and Procedure
12. Emergency Provisions: National Emergency, President Rule, Financial Emergency
13. Local Self Government – Constitutional Scheme in India
14. Provisions of civil services: Characteristics, functions, merits and demerits
15. Democratic principles in industry

Book

1. Durga Das Basu "An Introduction to Constitution of India" 22nd Edition, LexisNexis

Syllabus for Semester II, BE Computer Science & Engineering (Data Science)

Course Code : PEP151 **Course: Physical and Mental Health using Yoga/Sports**

L: 0Hrs, T: 0 Hr, P: 2Hr, Per Week **Total Credits : 0**

Course outcome

On successful completion of the course, students will be able to:

1. Understand fundamental skills and basic rules of games offered by the Physical Education Department of RCOEM.
2. Obtained health related physical fitness.
3. Develop body-mind co-ordination through games and yoga.
4. Changed sedentary life styles towards active living.

Brief Objectives of Sports/Yoga Practical Classes:

It has long been proven that a healthy body leads to a healthy mind. With a strong belief in this, Physical Education Department at RCOEM will conduct Sports/Yoga Classes with the objective of maintaining health, fitness and wellness of students as well as create awareness about need for good health and physical fitness. The objective would also be to make the all-round development with team spirit, social values as well as to identify and develop leadership qualities in students through various sports activities. Sports activities would also be conducted with the objective to provide better interaction and recreation to the students which is an important neutralizer for stress. Additionally, the objective would be to evaluate the health related fitness of students so as to recommend and conduct specific Yoga and Sports activities. The emphasis is on participation, with healthy competition.

Programme Outline

- **Sports**

1. Introduction to sports, offered by the department.
2. Health and safety issues related to sports; knowledge, recognition and ability to deal with injuries and illness associated with sports.
3. Practicing the fundamental skills and bringing awareness of basic rules and regulations.
4. Conduction of small recreational games and activities.

- **Yoga :** Includes various sitting, standing and lying Asanas, Suryanamaskars and Pranayamas.
- **Physical Efficiency Tests :** This includes 6 health related physical fitness tests.

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