SRI VASAVI ENGINEERING COLLEGE (Autonomous)

(Permanent Affiliation to JNTUK, Kakinada), PEDATADEPALLI, TADEPALLIGUDEM-534 101

Department of Computer Science and Engineering

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Department of Computer Science and Technology

SEMESTER – I (FIRST YEAR)

S.No.	Course Code	Name of the Course		L	T	P	C
1	V20MAT01	Linear Algebra and Differential Equations	BSC	3	0	0	3
2	V20CHT01	Engineering Chemistry	BSC	3	0	0	3
3	V20ENT01	English for Professional Enhancement	HSS	3	0	0	3
4	V20MEL02	Engineering Workshop	ESC	1	0	4	3
5	V20CST01	Programming in 'C' for problem Solving	ESC	3	0	0	3
6	V20ENL01	Hone Your Communications Skills Lab-I	HSS	0	0	3	1.5
7	V20CHL01	Engineering Chemistry Lab	BSC	0	0	3	1.5
8	V20CSL01	Programming Lab in 'C' for problem Solving	ESC	0	0	3	1.5
			Total	**13**	**0**	**13**	**19.5**

Total Contact Hours:26 **Total Credits:**19.5

SEMESTER – II (FIRST YEAR)

S.No.	Course Code	Name of the Course		L	T	P	C
1	V20MAT02	Numerical Methods and Vector Calculus	BSC	3	0	0	3
2	V20PHT01	Engineering Physics	BSC	3	0	0	3
3	V20ECT01	Switching Theory and Logic Design	ESC	3	0	0	3
4	V20CST02	Python Programming	ESC	3	0	0	3
5	V20MEL01	Engineering Graphics	ESC	1	0	4	3
6	V20PHL01	Engineering Physics Lab	BSC	0	0	3	1.5
7	V20CSL02	Python Programming Lab	ESC	0	0	3	1.5
8	V20ENL02	Hone Your Communications Skills Lab-II	HSS	0	0	3	1.5
9	V20CHT02	Environmental Studies	MNC	2	0	0	0
			Total	**15**	**0**	**13**	**19.5**

Total Contact Hours:28 **Total Credits:** 19.5

SEMESTER-III (SECOND YEAR)

S.No.	Course Code	Name of the Course		L	T	P	C
1	V20MBT51	Managerial Economics and Financial Analysis	HSS	3	0	0	3
2	V20MAT07	Mathematical Foundation Of Computer Science	ESC	3	0	0	3
3	V20CST03	OOPs Through C++	PCC	3	0	0	3
4	V20CST04	Data Structures	PCC	3	0	0	3
5	V20CST05	Computer Organization and Architecture	ESC	3	0	0	3
6	V20CSL03	OOPs Through C++ Lab	PCC	0	0	3	1.5
7	V20CSL04	Data Structures Lab	PCC	0	0	3	1.5
8	V20CSL05	Linux Shell Scripting Lab	PCC	0	0	3	1.5
9	V20CSP01	Community Service Project	CSP	0	0	8	4
10	V20SOC01	Skill Oriented Course – I*	SOC	1	0	2	2
11	V20ENT02	Professional Communication Skills –I	MNC	2	0	0	0
			Total	**18**	**0**	**19**	**25.5**

Total Contact Hours:37 **Total Credits:**25.5

SEMESTER - IV (SECOND YEAR)

S.No.	Course Code	Name of the Course		L	T	P	C
1	V20CST06	Design and Analysis of Algorithms	PCC	3	0	0	3
2	V20CST07	Software Engineering	PCC	3	0	0	3
3	V20CST08	Database Management Systems	PCC	3	0	0	3
4	V20CST09	Java Programming	PCC	3	0	0	3
5	V20MAT04	Probability and Statistics	BSC	3	0	0	3
6	V20CSL06	Statistical Visualization using R Lab	BSC	0	0	3	1.5
7	V20CSL07	Database Management Systems Lab	PCC	0	0	3	1.5
8	V20CSL08	Java Programming Lab	PCC	0	0	3	1.5
9	V20SOC02	Skill Oriented Course – II*	SOC	1	0	2	2
10	V20ENT03	Professional Communication Skills –II	MNC	2	0	0	0
			Total	**18**	**0**	**11**	**21.5**

Total Contact Hours:29 **Total Credits:**21.5

** The Student need to select one Skill Oriented Course from the given pool of courses.*

V SEMESTER (THIRD YEAR)

S.No.	Course Code	Name of the Course		L	T	P	C
1	V20CST10	Operating Systems	PCC	3	0	0	3
2	V20CST11	Data Mining	PCC	3	0	0	3
3	V20CST12	Web Technologies	PCC	3	0	0	3
4		**Open Elective -I / Job Oriented Elective-I**	OEC	3	0	0	3
			JOE	0	0	6	
5	**Professional Elective-I**		PEC	3	0	0	3
	V20CSTPE01	Software Testing Methodologies					
	V20CSTPE02	Principles of Programming Languages					
	V20CSTPE03	Artificial Intelligence					
	V20CSTPE04	Computer Graphics					
6	V20CSL09	Data Mining Lab	PCC	0	0	3	1.5
7	V20CSL10	Web Technologies Lab	PCC	0	0	3	1.5
8	V20SOC03	Skill Oriented Course-III (Soft Skills)	SOC/SS	1	0	2	2
9	V20CSP01	Mini Project / Internship	Internship	0	0	3	1.5
10	V20ENT04	Professional Communication Skills -III	MNC	2	0	0	0
			Total	**15**	**0**	**17**	**21.5**

Total Contact Hours: 32 **Total Credits: 21.5**

VI SEMESTER (THIRD YEAR)

S.No.	Course Code	Name of the Course		L	T	P	C
1	V20CST13	Computer Networks	PCC	3	0	0	3
2	V20CST14	Machine Learning	PCC	3	0	0	3
3	V20CST15	Automata and Compiler Design	PCC	3	0	0	3
4		**Open Elective -II / Job Oriented Elective-II**	OEC	3	0	0	3
			JOE	0	0	6	
5	**Professional Elective-II**		PEC	3	0	0	3
	V20CSTPE05	Object Oriented Software Engineering					
	V20CSTPE06	Advanced Data Structures					
	V20CSTPE07	Data Science					
	V20CSTPE08	Cryptography &Network Security					
6	V20CSL11	Computer Networks Lab	PCC	0	0	3	1.5
7	V20CSL12	Machine Learning Lab using Python	PCC	0	0	3	1.5
8	V20CSL13	Unified Modeling Language Lab	PCC	0	0	3	1.5
9	V20SOC04	Skill Oriented Course-IV*	SOC	1	0	2	2
10	V20CEMC02	Professional Ethics & Human Values	MNC	2	0	0	0
			Total	**15**	**0**	**17**	**21.5**

Total Contact Hours: 32 **Total Credits: 21.5**

** The Student need to select one Skill Oriented Course from the given pool of courses.*

VII SEMESTER(FOURTH YEAR)

S.No.	Course Code	Name of the Course		L	T	P	C
1	**Professional Elective-III**		PEC	3	0	0	3
	V20CSTPE09	Advanced Computer Architecture					
	V20CSTPE10	Big Data Analytics					
	V20CSTPE11	Deep Learning					
	V20CSTPE12	Human Computer Interaction					
2	**Professional Elective-IV**		PEC	3	0	0	3
	V20CSTPE13	Design Patterns					
	V20CSTPE14	NoSQL Databases					
	V20CSTPE15	Reinforcement Learning					
	V20CSTPE16	Cloud Computing					
3	**Professional Elective-V**		PEC	3	0	0	3
	V20CSTPE17	Software Project Management					
	V20CSTPE18	Scripting Languages					
	V20CSTPE19	Natural Language Processing					
	V20CSTPE20	Social Networks and Semantic Web					
4		**Open Elective -III / Job Oriented Elective –III**	OEC	3	0	0	3
			JOE	0	0	6	
5		**Open Elective -IV / Job Oriented Elective – IV**	OEC/JOE	3	0	0	3
6	V20MBT52	Management Science	HSS	3	0	0	3
7	V20SOC05	Skill Oriented Course-V*	SOC	1	0	2	2
8	V20CSP02	Mini Project /Internship	Internship	0	0	6	3
			Total	**16**	**0**	**14**	**23**

Total Contact Hours: 30 **Total Credits: 23**

** The Student need to select one Skill Oriented Course from the given pool of courses.*

VIII SEMESTER (FOURTH YEAR)

S.No.	Course Code	Name of the Course		L	T	P	C
1	V20CSP03	Internship/ Industrial Training /Practical training	PRO	0	0	4	2
2	V20CSP04	Major Project (6 Months)	PRO	0	0	12	6
			Total	**0**	**0**	**16**	**8**

Total Contact Hours: 16 **Total Credits: 08**

POOL OF SKILL ORIENTED COURSES

From the below list of Skill Oriented Courses students may opt any one course for each semester, without repetition .

S.No.	Name of the Course
1.	Mobile Application Development
2.	Mean Stack Technologies
3.	Secure DevOps
4.	AWS Cloud Computing
5.	SDG -Web Development
6.	Web Development using Django
7.	Game Development using Buildbox
8.	Game Programming
9.	.NET Framework
10.	CCNA IT Essentials
11.	Augmented Reality and Virtual Reality
12.	Go Programming
13.	Applications of Python using NumPy & Pandas
14.	Ethical Hacking
Any advanced courses offered by industries / Professional bodies / APSSDC can be appended in future	

List of Job Oriented Elective Courses

S.No.	Name of the Course
1.	Master Coding and Competitive Programming - Part-1
2.	Master Coding and Competitive Programming - Part-2
3.	Full Stack Technologies
4.	DevOps
5.	Blockchain Technologies

List of Open Elective Courses offered by other Branches:-

Civil Engineering:- ➢ Repair and Rehabilitation of Structures. ➢ Ground Improvement Techniques. ➢ Environmental Pollution and Control. ➢ Building Materials and Construction. ➢ Remote Sensing and GIS. ➢ Solid Waste Management. ➢ Disaster Management. ➢ Water Quality and Conservation Systems.	**Electrical & Electronics Engineering:-** ➢ Non-Conventional Energy Sources. ➢ Basics of Control systems. ➢ Principles of Electric Power Conversion. ➢ Programmable Logic Controller and Applications. ➢ Energy Storage Systems. ➢ Soft Computing Techniques. ➢ Electric Vehicles. ➢ Indian Electricity Act, 2003. ➢ Power Systems for Data Centers. ➢ Concepts of Power System Engineering. ➢ Fundamentals of Smart Grid Technologies. ➢ Distribution Automation.
Mechanical Engineering:- ➢ Basic Mechanical Engineering. ➢ Green Engineering Systems. ➢ Computational Fluid Dynamics. ➢ Rapid Prototyping. ➢ Computer Aided Design. ➢ Mechatronics.	**Electronics & Communication Engineering:-** ➢ Internet of Things. ➢ Communication Systems. ➢ Principles of Image Processing. ➢ Medical Electronics. ➢ Principles of Wireless Communications. ➢ Basics of VLSI Design. ➢ Concepts of Embedded Systems.

SYLLABUS

Semester	I	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20MAT01
Name of the Course	**Linear Algebra and Differential Equations**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Apply matrix technique to solve system of linear equations. **(K3)**
CO2: Find Eigen values and Eigen vectors. **(K3)**
CO3: Solve the ordinary differential equations of first order & first degree. **(K3)**
CO4: Solve the linear differential equations of higher order with constant coefficients. **(K3)**
CO5: Find maxima and minima of functions of two variables. **(K3)**

UNIT-I: System of linear equations: Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination – Gauss Jordon- Gauss Jacobi and Gauss Seidal methods.

UNIT-II: Eigen values, Eigen vectors and Cayley-Hamilton theorem: Eigenvalues - Eigen vectors– Properties – Cayley-Hamilton theorem (without proof) - Inverse and powers of a matrix by using Cayley-Hamilton theorem.

UNIT-III: Differential equations of first order and first degree: Linear- Bernoulli - Exact-Reducible to exact differential equations -Newton's Law of cooling-Law of natural growth and decay-Orthogonal Trajectories.

UNIT- IV: Linear differential equations of higher order: Linear non homogeneous differential equations of higher order with constant coefficients involving RHS term of the type e^{ax}, sinax, cosax, polynomials in x, $e^{ax}V(x)$, $xV(x)$- method of variation of parameters.

UNIT- V: Partial differentiation: Introduction to partial differentiation-Total derivative-Functional dependence-Jacobian.-maxima and minima of functions of two variables (without constraints) and Lagrange's method (with constraints).

Text Books:

1.B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.N.P.Bali, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1.Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition,Wiley-India
2.Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
3.Srimanta Pal, SubodhC.Bhunia, Engineering Mathematics, Oxford University Press.
4.Dass H.K., RajnishVerma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt.Ltd, Delhi.

Semester	I	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CHT01
Name of the Course	**Engineering Chemistry**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Solve boiler troubles originated due to poor water quality and suggest suitable water treatment methods. **(K3)**

CO2: Choose plastics and rubbers for engineering applications. **(K3)**

CO3: Associate concepts of Electro Chemistry in designing electrochemical energy systems. **(K2)**

CO4: Assess the quality of fuels. **(K3)**

CO5: Apply corrosion principles for protection of metallic structures. **(K3)**

UNIT-I: WATER TECHNOLOGY: Sources of water; Impurities in water, Hardness of water, Types of Hardness, Units of hardness, Determination of hardness of water, Numerical problems on temporary and permanent hardness. Boiler troubles: Priming and Foaming, Sludge and Scale formation, Boiler corrosion, Caustic embrittlement. Softening of hard water- Zeolite process and Ion exchange process; Water for drinking purpose, BSI standards of drinking water, Disinfection: Chlorination, Breakpoint chlorination. Desalination - Reverse Osmosis and Electro dialysis.

UNIT-II: POLYMER TECHNOLOGY : Introduction, Polymerization, Mechanism of Free radical addition polymerization; Plastics as engineering materials; Advantages and limitations, Thermoplastics and Thermosetting plastics, Fabrication of plastics (Compression, Injection, Transfer, and Extrusion Moulding) -Preparation, properties and applications of Polythene (HDPE and LDPE), PVC, Bakelite. Elastomers: Disadvantages of natural rubber, Vulcanization of rubber, Advantages of vulcanized rubber, Preparation, properties and applications of Buna -S and Buna-N.

UNIT-III: ELECTRO CHEMISTRY : Galvanic cell, Electrode potential and EMF-Reference electrodes (Calomel and Glass electrodes), Determination of pH of a solution using glass electrode, Conductometric titration (Strong Acid – Strong Base). Batteries: Types, Primary battery - Li-MnO2 battery, Secondary batteries - Lead acid battery, Lithium ion battery. Fuel cells: Definition, H2 - O2 fuel cell

UNIT-IV: FUEL TECHNOLOGY: Fuels – Characteristics of a good fuel, Classification of fuels, Calorific value (HCV and LCV),Dulong's formula, Numerical problems on HCV and LCV.
Solid fuels: Coal – Proximate and ultimate analysis, Significance of the analyses.
Liquid fuels: Petroleum composition, Classification, Synthetic petrol (Fischer Tropsch and Bergius process), Knocking, Anti knocking agents, Octane and Cetane ratings.
Gaseous fuels – Natural gas, LPG and CNG Biofuels - Biogas, Biodiesel.

UNIT-V : Corrosion: Definition, Theories of Corrosion (Chemical & Electrochemical), Pilling- Bedworth Rule, Galvanic corrosion and Pitting corrosion, Factors which influence the rate of corrosion. Protection from corrosion - Design & Selection of metals, Cathodic protection, Protective coatings – Metallic coatings (Anodic and cathodic coatings), Methods of application of coatings on metals (Galvanizing &Tinning).Nano materials: Introduction, Carbon nanotubes - preparation (Arc discharge, Laserablation and CVD Method) - Properties and applications of carbon nanotubes.

Text Books:

1. Engineering Chemistry by Jain and Jain; DhanpatRai Publications &Co.
2. A Text book of Engineering Chemistry by S. S. Dara; S. Chand &CoLtd.

Reference Books:

1. Engineering Chemistry by Vajiram and others. Wiley India Pvt.Ltd.,
2. Engineering Chemistry by PrasanthRath, Cengage Learning.
3. Engineering Chemistry by Shikha Agarwal; Cambridge University Press.
4. Engineering Chemistry, by B. Sivasankar,McGraw-Hill.

Semester	I	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20ENT01
Name of the Course	English for Professional Enhancement					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Identify the central theme of the text, use cohesive items for coherence in a paragraph, recognize nouns and basic sentence structures. **(K2)**

CO2: Restate the central idea of the letter by using appropriate vocabulary. Gain mastery over articles and prepositions. **(K2)**

CO3: Find the success formula after reading the text in detail to answer questions. Use appropriate tense and concord, find suitable vocabulary and format to draft letters and e-mails. **(K3)**

CO4: Employ reading skills to comprehend the given biography. Interpret visual information .Use quantifiers appropriately and get acquainted with formal drafting. **(K3)**

CO5: Appraise the delivered lecture and text, recognize the contextual vocabulary and prepare poster presentations. **(K4)**

UNIT-I : A DRAWER FULL OF HAPPINESS (From Infotech English, Maruthi Publications) Vocabulary: GRE Vocabulary , Antonyms and Synonyms, Word Applications, Verbal Reasoning and Sequencing of Words. Grammar: Nouns: Types of Nouns: Proper Noun, common noun, collective noun, material noun, abstract noun Listening: Listening to short audio texts and identifying the topic, context and specific pieces of information to answer a series of questions both in speaking and writing. Speaking: Self- Introduction and Introducing others. Asking and answering general questions on topics such as home, family, work, studies and interests.
Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.
Writing: Paragraph Writing
Non- Detailed : The Post Office by Rabindranath Tagore (Macmillan India)

UNIT-II: NEHRU'S LETTER TO HIS DAUGHTER INDIRA ON HER BIRTHDAY
(From Infotech English, Maruthi Publications).
Vocabulary: GRE Vocabulary, Antonyms and Synonyms
Grammar: Articles, Prepositions
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts both in speaking and writing.
Speaking: Discussion in pairs/ small groups on specific topics. Functional English: Greeting and Leave Taking.
Reading: Identifying sequence of ideas; Recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Identifying the main ideas, Rephrasing and Summarizing them .
Non- Detailed : The Post Office by Rabindranath Tagore (Macmillan India)

UNIT-III: STEPHEN HAWKING - POSITIVITY 'BENCHMARK'
(From Infotech English, Maruthi Publications).
Vocabulary: GRE Vocabulary
Grammar: Verbs, Tenses, Concord: Subject - Verb Agreement.
Listening: Listening for global comprehension and summarizing what is listened to both in speaking and writing
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.
Functional English: Complaining and Apologizing.
Reading: Reading a text in detail by making basic inferences –recognizing, and interpreting specific context clues; strategies to use text clues for comprehension, critical reading.
Writing: Letter writing- types, format and principles of letter writing, E-mail Etiquette
Non- Detailed : The Post Office by Rabindranath Tagore (Macmillan India)

UNIT-IV: LIKE A TREE, UNBOWED : WANGARI MAATHAI - BIOGRAPHY

(From InfotechEnglish, Maruthi Publications).

Vocabulary: GRE Vocabulary, Antonyms and Synonyms,

Grammar: Active & Passive Voice

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio), listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - Asking for and Giving Information/Directions. Functional English: Asking for Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in text to convey information.

Writing: Data Interpretation – Tree Diagram, Pie chart

Non- Detailed : The Post Office by Rabindranath Tagore (Macmillan India)

UNIT-V: STAY HUNGRY, STAY FOOLISH

(From Infotech English, Maruthi Publications).

Vocabulary: GRE Vocabulary, Antonyms and Synonyms

Grammar: Identifying and Correcting Common Errors in Grammar and Usage (articles, prepositions, tenses, subject-verb agreement), Reported Speech.

Listening: Identifying key Terms, Understanding Concepts and Interpreting the Concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts. Functional English: Suggesting/Opinion giving.

Writing: Poster Presentation.

Non- Detailed : The Post Office by Rabindranath Tagore (Macmillan India)

Books Prescribed:

1. "Infotech English", Maruthi Publications. (Detailed)
2. "The post Office" by Rabindranath Tagore, Macmillan India(Non -Detailed)

Reference books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge,2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading and Writing Student's Book Pack (B1) Macmillan Educational.
4. The Official Cambridge Guide to IELTS, for Academic and General Training.(2015)
5. Practical English Usuage, Michael Swan, OUP ,1995.

******Note:** The Lessons and GRE Vocabulary has been taken from Infotech English by Maruthi Publications
Non-detailed Text : Post Office by Rabindranath Tagore (Rupa Publications).

Semester	I	L	T	P	C	COURSE CODE
Regulation	V20	1	0	4	3	V20MEL02
Name of the Course	**Engineering Workshop**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Prepare different models in the carpentry trade and understand basic concepts of carpentry. **(K3)**

CO2: Develop various basic prototypes in the trade of Tin smithy and understand basic concepts of Tin smithy. **(K3)**

CO3: Prepare various basic prototypes in the trade of fitting and understand basic concepts of fitting. **(K3)**

CO4: Prepare different models in the Black smithy and understand basic concepts of Black smithy**.** **(K3)**

CO5: Develop various basic House Wiring techniques, Electrical wiring circuits. **(K3)**

CO6: Develop various basic prototype models in Welding and Foundry shop**.** **(K3)**

Module-I

General safety Considerations during operation of: Bench Tools, Hammers, Screw Drivers, Punches, Chisels, Scrapers, Scribers, Files, Pliers and Cutters, Wrenches, Hacksaw, Bench Vise, Hand drill, Taps and Dies, Hand Shears, Rules, Tapes and Squares, Soldering Iron, Rivets.

Hand Working Operations: Sawing, Filing, Threading, Scribing, Shearing, Soldering, Sharpening of hand tools. Measuring and Gauging: Calipers, depth Gauge, Feeler Gauge, Micrometers, Vernier Calipers, Vernier Height Gauge, Snap Gauge, Hole Gauge, Bevel Protractor, Dial Indicator, Gauge Blocks and Surface Plate

Module-II

Carpentry: Introduction, Carpentry Tools, Marking and Layout, Operations.

Sheet Metal Works : Introduction, Sheet Metal Tools, Marking and Layout, Operations – Bending, Cutting, Rolling.

Fitting : Introduction, Fitting Tools, Marking and Layout, Operations.

Forging : Introduction , Forging Tools ,Operations – Upsetting, Drawing, Cutting, Bending, Punching, Forging Presses and Hammers.

House wiring: Introduction, House wiring Tools and accessories, Connections, Circuit diagrams.

Metal Joining: Safety Considerations, Introduction, Soldering, Brazing, Welding – Gas Welding, Arc Welding,

Foundry: Introduction, Pattern Making, Foundry Tools, Core Making, Melting Furnace – Cupola, Sand Casting Process.

Module-III

Note: At least two exercises to be done from each.

Carpentry

1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tenon Joint

Tin Smithy

1. Taper Tray
2. Square Box without lid
3. Open Scoop
4. Funnel

Fitting shop

1. V- Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

Black smithy

1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring
4. Round Rod to Square headed bolt

House wiring

1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting
4. Measurement of Earth Resistance

Welding shop (Arc welding)

1. Butt Joint
2. Lap Joint

Foundry Practice

Preparation of sand mould using split piece pattern and cast the component.

Text Books:

1. A Course in Work shop Technology, Vol.1, Raghuwanshi, DhanpatRai&Co.
2. Elements of Workshop Technology, Vol.1, S.K.HajraChoudary, Asia Publishing House.
3. Production Technology, Vol.1, R.K.Jain and S.C Gupta, Khanna Publications.
4. Workshop Practice Manual,K.Venkata Reddy, B.S.Publications.
5. Workshop Manual, P.Kannaiah, KL.Narayana, Scitech Publications.

Semester	I	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST01
Name of the Course	**Programming in 'C' for problem Solving**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe various problem solving strategies such as Algorithms and Flowcharts. **(K2)**
CO2: Develop various programming constructs using Control Structures. **(K3)**
CO3: Construct Programs using modular programming approach. **(K3)**
CO4: Illustrate the usage of Arrays, String and pointers. **(K3)**
CO5: Construct Programs using Structures, Unions and Files. **(K3)**

UNIT-I: Problem solving concepts: Algorithms, Flow-charts, Types of Programming Languages, Compiler, Assembler and Linker, Testing and Debugging a program. Introduction to C Programming: Overview and importance of C, C Program Structure, Creation and Compilation of C Programs, Identifiers, Variables, Data types, Constants, Declarations, Input and output statements: Input and output functions...

UNIT-II: Operators: Arithmetic, relational and logical operators, increment and decrement operators, conditional operator, assignment operator, bitwise operators, special operators, expressions, Precedence, Associatively, Order of evaluation, Type conversion, Programming Examples. Control Structures: Conditional statements - If-else, Switch-case constructs, Loops - while, do-while, for..

UNIT-III: Functions: Top down approach of problem solving, standard library functions, user defined functions, parameter passing - call by value, call by reference, return statement, passing arrays as parameters to functions, recursion. Storage Classes: Scope and extent, Storage Classes - auto, extern, static and register.
Understanding pointers: Accessing the address of a variable, declaring pointer variables, initialization of pointer variables, accessing a variable through its pointer, pointer arithmetic.

UNIT-IV: Arrays: Single-Dimensional Arrays, multi-Dimensional Arrays, initialization and accessing individual elements. Strings in C-Concepts, string handling functions. Pointer and arrays, pointers and character strings, array of pointers. Dynamic Memory Allocation: calloc(), malloc() andfree()

UNIT-V: Structures: Defining, declaring, initialization, accessing, comparing, operations on individual members, array of structures, structures with in structures, structures and functions, bit fields, Programming Examples. **Unions:** Definition – difference between structures and unions – declaring and accessing unions.– pointers and structures – self-referential structures.
File Processing: Creating and Opening a file, file opening modes, closing a file, input/output operations on files, error handling during I/O operations, random access to files, Command line arguments. Programming Examples.

Text Books:

1. Programming in ANSI C by E Balagursamy, McGraw Hill, 8thEdition.

Reference Books:

1. Let Us C, YashavantKanetkar, BPB Publications, 15thEdition
2. Programming in C, ReemaThareja,Oxford.
3. Programming with C, Second edition, Byron S Gottfried, Tata McGrawhill
4. Problem Solving and Programm design in C, Hanly J R &Koffman E.B, Pearson Education, 2009.
5. Programming in C, PradipDey, ManasGhosh, Oxford University Press,2007.
6. Problem Solving Using C: Structured Programming Techniques,YukselUckan.
7. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.
8. Computer Programming in C – Kerninghan& Ritchie, PHI
9. C: The Complete Reference: Herbert Schildt, Osborne/McgrawHill,Inc.

Semester	I	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20ENL01
Name of the Course	Hone your Communication Skills Lab – I					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Identify suitable expressions to greet people, say good bye to them, introduce one another, listen to consonants. **(K2)**

CO2: Select suitable words to invite someone, accept or decline invitations, listen to…, identify and produce vowel sounds. **(K2)**

CO3: Choose suitable expressions to seek/refuse permissions, to apologize and listen to word accent. **(K3)**

CO4: Find apt expressions to give suggestions, express opinions, use appropriate words to give commands and requests. **(K3)**

CO5: Practise listening to dialogues, role-plays using common vocabulary used in dialogues. **(K3)**

UNIT-I: Hello, I'm

- Greeting people
- Saying goodbye to people
- Introducing yourself to someone/someone to someone else
- Listening and Identifying Consonants

UNIT-II: I Would Love to…. but,

- Inviting someone
- Accepting or declining invitations
- Complaining about something
- Listening to, Identifying and Producing Vowel Sounds

UNIT-III: With Your Permission I would like to…..

- Seeking Permission
- Granting/refusing permissions
- Apologising
- Listening to syllables and Word Accent and practise.

UNIT-IV: Why don't we….?

- Making Suggestions
- Agreeing/disagreeing with a suggestion
- Expressing Opinions
- Giving Commands/instructions
- Requesting someone for something

UNIT-V: Dialogues

- The norms of dialogues
- Common vocabulary used in dialogues
- Carrying on a dialogue
- Listening to dialogue.

Book Prescribed:

1. Strengthen Your Steps - A multimodal course in communication skills (Maruthi Publications)

Books for Further Reference:

1. Better English Pronunciation (J.D.O'Connor), Cambridge University.
2. English Conversation Practice (A Practical Guide to improve Conversational Skills), Sterling Publishers.
3. Exercise in spoken English, Parts-I-III.CIFEL, Hyderabad, Oxford University Press.

Semester	I	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CHL01
Name of the Course	Engineering Chemistry Lab					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Analyse quantitatively a variety of samples using volumetric methods and instrumental methods. **(K4)**

CO2: Apply volumetric and instrumental methods for the determination of water quality parameters namely Alkalinity, Hardness and pH. **(K3)**

CO3: Prepare polymeric materials and analyse the given coal samples. **(K3)**

LIST OF EXPERIMENTS

1. Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis etc.,
2. Estimation of HCl using standard Na2CO3 solution.
3. Estimation of KMnO4 using standard oxalic acid solution.
4. Determination of alkalinity of a sample of water.
5. Determination of total hardness of water using standard EDTA solution.
6. Estimation of ferrous iron using standard K2Cr2O7 solution.
7. Estimation of copper using standard EDTA solution.
8. Estimation of % available chlorine in bleaching powder.
9. Estimation of pH of the given sample solution using pH meter.
10. Conductometric titration between strong acid and strong base.
11. Proximate analysis of coal.
12. Preparation of phenol – formaldehyde resin.

Text Books:

1. Lab manual prepared by Department of Chemistry, Sri Vasavi Engineering College.

Reference Books:

1. Practical Engineering Chemistry by K. Mukkanti, B.S. Publications.
2. Vogel's Quantitative Chemical Analysis – 5th Edition, Longman.
3. A Text Book on experiments and Calculations Engineering by S.S.Dara, S.Chand& Co Ltd.

Semester	I	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL01
Name of the Course	**Programming Lab in 'C' for problem Solving**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Demonstrate problem solving techniques. **(K3)**

CO2: Construct Programs using the concepts of Arrays, Strings and Pointers. **(K3)**

CO3: Apply the concepts of Functions, Structures and Unions. **(K3)**

CO4: Use various file processing operations to develop real-time applications. **(K4)**

LIST OF EXPERIMENTS

Tutorial 1: Problem solving using computers**.**
Lab1: Familiarization with programming environment.

Tutorial 2: Variable types and type conversions.
Lab 2: Simple computational problems using arithmetic expressions.

Tutorial 3: Branching and logical expressions.
Lab 3: Problems involving if-then-else structures switch – case.

Tutorial 4: Loops, while and for loops.
Lab 4: Iterative problems e.g. sum of series.

Tutorial 5: Functions call by value, call by reference
Lab 5: Simple functions.

Tutorial 6: Recursion, structure of recursive calls.
Lab 6: Recursive functions.

Tutorial 7: Pointers.
Lab 7: Programming with pointers.

Tutorial 8: 1D Arrays: searching, sorting.
Lab 8: 1D Array manipulation.

Tutorial 9: 2D arrays.
Lab 9: Matrix problems.

Tutorial 10: String handling.
Lab 10: String handling functions.

Tutorial 11: Structures, unions and dynamic memory allocation.
Lab 11: Structures & unions.

Tutorial 12: File handling, command line arguments.
Lab 12: File operations.

Text Books:

1. Programming in Ansi C by E Balagursamy, McGraw Hill, Eight Edition.

Reference Books:

1. Mastering C, K.R. Venugopal and S.R. Prasad, TMHPublishers.
2. Computer Programming in C, V. Rajaraman,PHI.
3. Programming in C, Stephen G. Kochan, Fourth Edition, PearsonEducation.
4. C- The Complete Reference, Herbert Schildt, Osborne/McgrawHill,Inc.
5. Programming with C, Byron S Gottfried, Second edition, Tata McGrawhill.
6. Programming in C, ReemaThareja, Oxford.
7. Problem Solving and Program design in C, Hanly J R &Koffman E.B, Pearson Education,2009
8. Programming and Problem Solving Using C, ISRD Group, Tata McGrawHill,2008.

Semester	II	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20MAT02
Name of the Course	Numerical Methods and Vector Calculus					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Compute approximate roots of algebraic and transcendental equations and interpolating polynomial for the given data. **(K3)**

CO2: Solve ordinary differential equations with initial conditions using numerical methods. **(K3)**

CO3: Find multiple integrals and improper integrals. **(K3)**

CO4: Calculate gradient of a scalar function, divergence and curl of a vector function. **(K3)**

CO5: Apply the knowledge of vector integral concepts to find characteristics of vector fields. **(K3)**

UNIT-I: Solution of Algebraic and Transcendental Equations and Interpolation: Introduction- Bisection method – Method of false position– Newton-Raphson method (One variable) - finite differences- forward differences, backward differences – simple relations on forward, backward, central, average and shifting operators - Newton's formulae for interpolation - Lagrange's interpolation formula.

UNIT-II: Numerical Integration and solution of Ordinary Differential equations: Trapezoidal rule- Simpson's **1/3**rd and **3/8**th rule – Solution of ordinary differential equations by Taylor's series - Picard's Method- Euler's method - Euler's modified Method – Runge-Kutta method (fourth order).

UNIT-III: Multiple Integrals: Definition of Improper integrals - Double and triple integrals – Change of variables – Change of order of integration.

UNIT-IV: Vector Differentiation: Vector differential operator-Gradient-Divergence-Curl-Laplacian and second order operators -Vector identities.

UNIT- V: Vector Integration: Line integral: Work done – Potential function – Surface and volume integrals - Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, **43**rd Edition, KhannaPublishers.
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, **10**th Edition,Wiley-
2. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRCPress
3. V.Ravindranath and P.Vijayalakshmi, Mathematical Methods, Himalaya Publishing House**,**India.
4. Srimanta Pal, SubodhC.Bhunia, Engineering Mathematics, Oxford UniversityPress.
5. Dass H.K., RajnishVerma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt.Ltd, Delhi.

Semester	II	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20PHT01
Name of the Course	**Engineering Physics**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Associate the basic principles of structure of materials, crystallography and X-ray diffraction. **(K2)**

CO2: Prepare the students to the basic concepts of Lasers and their applications in optical fiber communication Link. **(K3)**

CO3: Indicate the applications of sound waves in various fields. **(K2)**

CO4: Interpret wave and particle behavior of matter and relate it to electron theory of metals. **(K3)**

CO5: Examine the advanced concepts of engineering materials like Semiconductors, Superconductors and Dielectrics. **(K3)**

UNIT-I : CRYSTALLOGRAPHY : Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Crystal systems- Bravais lattices– Structures and packing fractions of SC,BCC and FCC

RAY DIFFRACTION: Directions and planes in crystals – Miller indices – Separation between successive [h k l] planes – Bragg's law-Bragg's x-ray spectrometer.

UNIT-II: LASERS: Introduction –Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients –Pumping schemes– Population inversion– Ruby laser- Helium Neon laser-Applications of LASER.**FIBEROPTICS:** Introduction – Structure of an optical fiber – Principle of Optical Fiber – Acceptance angle and acceptance cone – Numerical aperture- Basic optical communication system-Advantages of optical fibers over conventional transmission lines.

UNIT–III: ACOUSTICS: Introduction - Sound absorption- Absorption coefficient- Reverberation- Reverberation Time – Basic requirements for constructing an acoustically good hall - Sabine's formula- Factors affecting acoustics of buildings and their remedial measures. **ULTRASONICS:** Introduction- Production of Ultrasonic Waves Using Piezoelectric Effect and Magnetostriction Method- Non-Destructive Testing - Pulse Echo Technique – Applications of ultrasonics.

UNIT – IV: QUANTUM MECHANICS: Introduction-de-Broglie's concept of matter waves – Schrodinger's Time Independent & time dependent wave equations –Physical significance of the wave function- Particle in a one dimensional potential box. **FREE ELECTRON THEORY:** Classical free electron theory (qualitative) – Assumptions and failures-Quantum free electron theory – Equation for electrical conductivity based on quantum free electron theory- Density of states (3D) - Fermi energy- Fermi – Dirac distribution.

BAND THEORY OF SOLIDS: Bloch's function (qualitative) – Kronig – Penney model (qualitative)–formation of energy bands in crystalline solids based on Kronig Penny model – E vs K diagram- v vs K diagram- effective mass of an electron- Classification of crystalline solids-concept of hole.

UNIT – V : SEMICONDUCTOR PHYSICS: Introduction - Types of Semiconductors - Intrinsic Semiconductors - Carrier concentration– Expression for Conductivity- Extrinsic semiconductors-Carrier concentrations- Dependence of Fermi energy on carrier concentration and temperature- Drift and diffusion currents- Einstein's Equation- Hall Effect- Hall coefficient- Applications of Hall Effect. SUPERCONDUCTIVITY: Introduction- General properties – Meissner effect - Type I and Type II Superconductors- BCS Theory – Josephson effects (AC and DC) - Applications of superconductors.

DIELECTRIC PROPERTIES: Introduction- Types of polarizations- Electronic, Ionic and Orientation polarizations (qualitative) – Internal electric field – Clausius- Mossoti Equation.

Text Books:

1. A Text book of Engineering Physics, M.N. Avadhanulu and P.G.Kshirasagar,S.ChandPublications.
2. Engineering Physics DK Bhattacharya, Poonam and TandomPublications.

Reference books:

1. Solid state Physics, A.J. Dekker by McMillan India Ltd.
2. Introduction to Solid state Physics, Charles Kittle, Willey India Pvt. Ltd.
3. Solid state Physics, S.O. Pillai by New Academic Science.
4. Basic Engineering Physics, Dr.P. Sreenivasa Rao, Himalaya Publishers.
5. Engineering Physics, V. Rajendran, McGrawHill.
6. Engineering Physics, Sanjay D Jain and Girish G Sahasrabudhe., UniversityPress.
7. Engineering Physics, Gaur and Guptha, DhanpatRai Publications.
8. Engineering Physics, P.K. Palanisamy, SciTechPublishers.

Semester	II	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20ECT01
Name of the Course	Switching Theory and Logic Design					
Branch	Common to EEE, ECE, ECT, CSE & CST					

Syllabus Details

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

CO1: Explain the different types of number Systems, number conversions, codes and logic Gates. **(K2)**

CO2: Apply the concepts of Boolean algebra and use the knowledge of K-maps and tabular method for minimization of Boolean expressions. **(K3)**

CO3: Construct the higher order modules from their lower order structures of various M combinational logic circuits. **(K3)**

CO4: Explain the concept of various flip flops. **(K2)**

CO5: Develop various sequential circuits like registers, counters and various Finite State Machine Models. **(K3)**

UNIT– I: Number Systems & Codes: Representation of numbers of different radix, conversation from one radix to another radix, r and (r-1)'s compliment of signed members. Basic logic operations -NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR – Gates.

Binary Codes: BCD,Excess-3,Graycode,2421,84-2-1,errordetection,error correction codes - Hamming Code

UNIT– II: Minimization Techniques : Boolean theorems, principle of complementation & duality, De-morgan theorems, minimization of logic functions using Boolean theorems, Standard SOP and POS, Forms, NAND-NAND and NOR-NOR realizations, minimization of switching functions using K-Map up to 5 variables, tabular minimization.

UNIT– III: Combinational Logic Circuits Design : Half adder, full adder, half subtractor, full subtractor, Ripple Carry adder and subtractor, 4 bit binary adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit, Design of decoder, demultiplexer, 7 segment decoder, Implementation of higher order circuits using lower order circuits for MUX, DEMUX, DECODER, realization of Boolean functions using decoders and multiplexers, priority encoder.

UNIT– IV: Sequential Circuits –I : Classification of sequential circuits (synchronous and asynchronous); basic flip-flops, truth tables and excitation tables (Nand RS latch, nor RS latch, RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals). AsynchronousInputs(PresetandClear),Racearoundcondition,MasterSlave JK Flip flop, Conversion from one flip-flop to another flip-flop.

UNIT–V: Sequential Circuits –II : Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers – Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register. **Finite State Machine:** Introduction to Mealy and Moore Finite state Machines

Text Books:

1. Digital Design by M. Morris Mano, Michael D. Ciletti,PEA.
2. Fundamentals of Logic Design, 5/e Roth,Cengage.
3. Modern Digital Electronics by RP Jain,TMH

Reference Books:

1. An Engineering Approach to Digital Design, William I. Fletcher, Pearson edition.
2. Switching Theory and Logic Design by A. Anand Kumar
3. Switching&FiniteAutomataTheory,2ndEdition, ZviKohavi, TMH,1978.

Semester	II	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST02
Name of the Course	**Python Programming**					
Branch	Common to CSE & CST					

Syllabus Details

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

CO1: Illustrate basic concepts of Python Programming. **(K2)**
CO2: Describe control structures in python. **(K2)**
CO3: Construct python programs using structured data types. . **(K3)**
CO4: Demonstrate functions and packages. . **(K3)**
CO5: Develop programs on Files, Exception handling and OOPs Concepts. **(K3)**

UNIT-I: Introduction to Python, Data Types & Operators: Basics of python programming: Features of python – History of Python - Python installation and execution - Data types – Identifiers - variables – type conversions- Literals, Constants – Numbers – Strings. I/O statements. Operators and expressions, operator precedence – expression evaluation.

UNIT-II: Control Structures: Decision Control statements: conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: while loop, for loop, nested for loop, range function, break, continue and pass statements.

UNIT-III: Structured Data Types: Lists: list operations, list slices, list methods, cloning lists, list parameters. Tuples: tuple assignment, tuple as return value. Set: Set Creation, Set Operations. Dictionaries: Creation, operations; comprehension, operations on strings.

UNIT-IV: Functions& modules: Introduction - Function Declaration &Definition - Function Call – Variable Scope and Lifetime - The return statement-More on Defining Functions - Lambda Functions or Anonymous Functions - Documentation Strings- Modules – Packages.

UNIT-V: Files & Exception Handling: Introduction - Types of files - Text files - reading and writing files; Errors and exceptions handling. OOPS concepts Classes, Methods, Constructor, Inheritance, Overriding Methods, Data hiding, TKINTER.

Text Books:

1. "Python Programming using problem solving Approach" ReemaThareja, Oxford University Press –2017.
2. Python with Machine Learning by "A.Krishna Mohan, Karunakar & T.Murali Mohan" by S. ChandPublisher-2018.

Reference Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff /O‘Reilly Publishers,
2. 2016 (http://greenteapress.com/wp/think- python)
3. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.,2011.
4. John V Guttag, ―Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press ,2013.

Semester	II	L	T	P	C	COURSE CODE
Regulation	V20	1	0	4	3	V20MEL01
Name of the Course	**Engineering Graphics**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the basic commands in CAD Software and draw the conic sections. **(K3)**

CO2: Construct different types of scales and special curves. (**K3)**

CO3: Draw the projections of the points and lines. **(K3)**

CO4: Develop the projections of planes and surfaces of regular solids. **(K3)**

CO5: Draw the Isometric projections and conversion of views. **(K3)**

UNIT-I: Introduction to CAD Software: CAD Software Mechanical Desktop, Draw, Modify, Dimension tool bars, Annotations, Layers, ISI conventions in drawing. CONIC SECTIONS – Ellipse, Parabola and Hyperbola

UNIT-II: SPECIAL CURVES & SCALES: Special Curves – cycloid, epicycloids, hypocycloid; Scales – Plain, Diagonal and Vernier Scales.

UNIT-III: ORTHOGRAPHIC PROJECTIONS: Introduction to Orthographic Projections- Projections of Points, Projection of lines inclined to both the planes.

UNIT-IV: PROJECTION OF PLANES : Inclined to both the Planes.

PROJECTION OF REGULAR SOLIDS : Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes, Development of Surfaces of regular solids.

UNIT-V: ISOMETRIC PROJECTIONS: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple solids. Conversion of Isometric Views to Orthographic Views and Vice-versa.

Text Books:

1. Engineering Drawing by N.D. Bhat, Chariot Publications, 53rdEdition-2014
2. Engineering Drawing by Agarwal&Agarwal, Tata McGraw Hill Publishers, 2ndEdition- 2016

Reference Books:

1. EngineeringDrawingbyK.L.Narayana&P.Kannaiah,ScitechPublishers,2ndEdition-2014
2. Engineering Graphics for Degree by K.C. John, PHIPublishers-2014
3. Engineering Graphics by PI Varghese, McGrawHillPublishers-2013
4. EngineeringDrawingAutoCad–KVenugopal,V.PrabhuRaja,NewAge,5thEdition-2015

Semester	II	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20PHL01
Name of the Course	Engineering Physics Lab					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Analyze the physical principle involved in the various instruments; also relate the principle to new application. **(K4)**

CO2: Demonstrate the various experiments in the areas of optics, mechanics and Electronics in all branches of engineering. **(K3)**

CO3: Think innovatively and also apply the creative skills that are essential for engineering. **(K4)**

LIST OF EXPERIMENTS

(Any eight of the following to be done)

1. Determination of Rigidity modulus of a material – Torsional Pendulum
2. Determination of acceleration due to gravity – Compound Pendulum
3. Verification of laws of vibrations in stretched strings – Sonometer
4. Determination of velocity of sound – Volume Resonator
5. Verification of Magnetic field Induction along the axis of current carrying coil – Stewart and Gee's apparatus.
6. Determination of Planck's constant using photocell.
7. Determination of wave length of laser source using diffraction grating.
8. Determination of frequency of electrically driven tuning fork - Melde's experiment – Transverse and longitudinal modes. 9. Study of V/I Characteristics of Zener diode
10. Draw the frequency responsive curves of L-C-R Series Resonance Circuit.
11. Determination of Energy band gap of a Semiconductor p-n junction
12. Characteristics of Thermistor – Negative Temperature Coefficient of resistivity.

Virtual labs: (Any two of the following to be done)

1. Crystal Structure.
2. Numerical Aperture of an Optical Fiber.
3. Photo-Electric Effect.
4. Hall Effect.

Semester	II	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL02
Name of the Course	**Python Programming Lab**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Demonstrate Basic Python Programs. (**K3**)
CO2: Construct control structures in python. (**K3**)
CO3: Demonstrate functions and packages. (**K3**)
CO4: Construct python programs using structured data types**.** (**K3**)
CO5: Demonstrate Text Files and exception handling. (**K3**)

LIST OF EXPERIMENTS

Exercise 1 **–Basics**

a) A sample Python Script using command prompt, Python Command Line and IDLE.
b) A program to purposefully raise an Indentation Error and correct it.

Exercise 2 **- Operations**

a) A program to compute distance between two points taking input from the user (Pythagorean Theorem)
b) A program on add.py that takes **2** numbers as command line arguments and prints its sum.

Exercise 3- Control Flow

a) A Program to implement for checking whether the given number is a even number or not.
b) A program to construct reverse the digits of a given number and add it to the original, If the sum is not a palindrome repeat this procedure.
c) A program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow – Continued

a) A program to construct the following pattern, using a nested forloop.

```
*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
```

b) By considering the terms in the Fibonacci sequence whose values do not exceedfour million,find the sum of the even-valued terms.

Exercise 5- Structured Data types

a) A program to count the number of strings where the string length is **2** or more and the first and last character are same from a given list of strings.
b) A program to develop unzip a list of tuples into individual lists and convert them into dictionary.

Exercise 6 **-Structured Data types Continued**

a) A program to count the numbers of characters in the string and store them in a dictionary data structure.
b) A program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise 7 – Problem Solving using Functions

a) Find mean, median, mode for the given set of numbers passed as arguments to a function.
b) Develop a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
c) Develop a Recursive Function to find the Factorial of a given number.
d) Develop function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 8**– Modules**

a) Install packages requests, flask and explore them using(pip).
b) A program to implement a script that imports requests and fetch content from the page.Eg. (Wiki)
c) Develop a simple script that serves a simple HTTPResponse and a simple HTML Page.

Exercise 9**- Files**

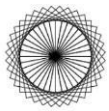
a) A program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
b) A program to compute the number of characters, words and lines in a file.

Exercise 10**-OOP**

a) Class variables and instance variable and illustration of self-variable
   i) Robot
   ii) ATM Machine

Exercise - 11 GUI, Graphics

a) Develop a GUI for anExpression
b) A program to implement the following figures usingturtle



Text Books:

1. "Python Programming using problem solving Approach" ReemaThareja, Oxford University Press – **2017.**
2. Python with Machine Learning by "A.Krishna Mohan, Karunakar&T.Murali Mohan" by S. Chand Publisher-**2018.**

Semester	II	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20ENL02
Name of the Course	**Hone your Communication Skills Lab-II**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Collect suitable expressions and vocabulary to participate in JAM. Identify root words. **(K1)**

CO2: Prepare, face and perform well in interviews with required etiquette.
Use appropriate telephone etiquette to succeed in telephonic interviews. **(K3)**

CO3: Show team spirit and communicative skills in group discussion. **(K3)**

CO4: Arrange ideas and prepare to give presentations in a professional manner. **(K3)**

CO5: Debate rationally and cogently while putting forth the ideas. **(K4)**

UNIT-I: JAM Session & Root Words

- Preparation for JAM Session
- Participation in JAM
- Root words from Word power made easy by Norman Lewis

UNIT-II: Interviews

- Guidelines for facing interviews
- Three R's of interviews
- Practice Activity (Mock Interviews)
- Root words from Word power made easy by Norman Lewis
- Telephone Etiquette
- Preparing for telephonic interviews
- Acing interviews
- Practice Activity (Mock Interviews)
- Root words from Word power made easy by Norman Lewis

UNIT-III: Group Discussions

- Tips to participate in Group Discussion
- Practice Activity
- Root words from Word power made easy by Norman Lewis

UNIT-IV: Presentation and Public Speaking

- Three P's of Presentation
- Do's and Don'ts in a Power-point Presentation
- Oral Presentations
- Introduction to Public Speaking
- Strategies for successful Public Speaking
- Practice Activity

UNIT-V: Debate

- Introduction to Debate
- Parts of a Debate
- Guidelines to participate in a Debate
- Practice Activity

Book Prescribed:

1.Strengthen Your Steps - A multimodal course in communication skills (Maruthi Publications)

Books for further Reference:

1. English Language Communication Skills, Lab Manual cum Workbook (with CD),Cengage Learning.

2. The Students Companion –Wilfred D. Best (New Edition) – Harper,CollinsPublishers,2012.

3. Hewings, Martin. Cambridge Academic English (B2).CUP, 2012. 4. Lewis, Norman. Word Power Made Easy, GoyalSaab,Publication

Semester	II	L	T	P	C	COURSE CODE
Regulation	V20	2	0	0	0	V20CHT02
Name of the Course	Environmental Studies					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Recognise the importance of environment and ecosystem services. **(K2)**

CO2: Identify the characteristic features, uses and impact of overutilization of natural resources. (**K2)**

CO3: Explain biodiversity, biodiversity services and conservation of biodiversity. **(K2)**

CO4: Report the causes and impacts of various pollutions. **(K2)**

CO5: Illustrate social and global environmental issues; sustainable development practices. **(K2)**

UNIT-I: MULTIDISCIPLINARY NATURE OF ENVIRONMENT & ECOSYSTEM: Definition, Scope and importance of environment, Types of environment, Multidisciplinary nature of Environmental Studies, Components of environment. Ecosystem –Concept of an Ecosystem, Structure and function of an Ecosystem, Food chain & food web, Ecological Pyramids, Structure and function of Forest, Desert, Pond and Marine ecosystem.

UNIT-II: NATURAL RESOURCES: Forest Resources: Uses, Overexploitation, Deforestation. Water resources: Aquifers, Dams and benefits, Conflicts over water. Mineral resources: Uses, Overexploitation, Environmental impact of extraction and use of mineral resources. Land resources: Degradation, Soil erosion and desertification, Landslides. Renewable Energy resources: Solar energy, Geo thermal energy, Tidal Energy.

UNIT-III: BIODIVERSITY AND ITS CONSERVATION: Definition, Levels of Biodiversity, Values of Biodiversity, Hotspots of Biodiversity, Threats to Biodiversity, Endangered and Endemic species of India, In-situ and Ex-situ Conservation.

UNIT-IV: ENVIRONMENTAL POLLUTION : Definition of pollution, Air pollution- Types of Air pollutants, Effects and control measures; Water pollution- Causes, Effects and control measures; Soil pollution; Biomedical waste; Industrial waste- Process of waste management, Sanitary land fill, Incineration, 3R strategy; E- Waste and its management.

UNIT-V: SOCIAL AND GLOBAL ENVIRONMENTAL ISSUES & ACTS : Women Education, Value education, Role of information technology on environment and human health, Acid rains, Global warming, Ozone layer depletion. Population growth. Importance of environmental legislation, Environmental Protection Act, Air Act (Prevention and control of pollution), Water Act.

Text Books:

1. Environmental Studies, Fourth Edition, ANubhaKaushik, C P Kaushik, New Age International Pubishers.
2. A Textbook of Environmental Studies, ShashiChawla, TMH, NewDelhi.
3. Fundamentals of Environmental Studies, DD Mishra, S Chand & Co.Ltd.
4. Textbook of Environmental Science, DR M. Anjireddy, B.S Publications, Hyderabad.

Semester	III	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20MBT51
Name of the Course	Managerial Economics and Financial Analysis					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the basic concepts of managerial economics, demand, elasticity of demand and methods of demand forecasting. **(K2)**

CO2: Interpret production concept, least cost combinations and various costs concepts in decision making. **(K3)**

CO3: Differentiate various Markets and Pricing methods along with Business Cycles. **(K2)**

CO4: Prepare financial statements and its analysis. **(K3)**

CO5: Assess various investment project proposals with the help of Capital Budgeting techniques for decision making. **(K3)**

UNIT-I: Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics and Scope-Managerial Economics and its relation with other subjects-Concept of Demand-Types-Determinants-Law of Demand its Exceptions-Elasticity of Demand-Types and Measurement- Demand forecasting and its Measuring Methods.

UNIT-II: Production and Cost Analysis: Production function-Iso-quants and Iso-cost-Law of Variable proportions- Cobb-Douglas Production function-Economies of Scale-Cost Concepts- Opportunity Cost-Fixed vs Variable Costs-Explicit Costs vs Implicit Costs- Cost Volume Profit analysis- Determination of Break-Even Point- BEP Chart (Simple Problems).

UNIT-III: Introduction To Markets, Pricing Policies & forms of Organizations and Business Cycles: Market Structures: Perfect Competition, Monopoly, Monopolistic and Oligopoly – Features – Price, Out-put Determination – Methods of Pricing: Evolution of Business Forms - Features of Sole Trader – Partnership – Joint Stock Company – State/Public Enterprises. Business Cycles – Meaning and Features – Phases of Business Cycle.

UNIT-IV: Introduction to Accounting & Financing Analysis: Introduction to Double Entry System – Preparation of Financial Statements- Trading Account, Profit & Loss Account and Balance Sheet - Ratio Analysis – (Simple Problems).

UNIT-V: Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Need for Capital Budgeting-Techniques of Capital Budgeting-Traditional and Modern Methods.

Text Books:

1. Dr. N. Appa Rao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis',Cengage Publications,New Delhi – 2011
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.

References:

1. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics &Financial Analysis,Himalaya Publishing House, 2014.
2. V. Maheswari: Managerial Economics, Sultan Chand.2014
3. Suma Damodaran: Managerial Economics, Oxford 2011.
4. VanithaAgarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja: Financial Accounting for Managers, Pearson
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui& A. S. Siddiqui: Managerial Economics and Financial Analysis, New AgeInternational Publishers, 2012
8. Ramesh Singh, Indian Economy, 7th Edn., TMH2015
9. PankajTandonA Text Book of Microeconomic Theory, Sage Publishers, 2015
10. ShailajaGajjala and UshaMunipalle, Univerties press, 2012.

Semester	III	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20MAT07
Name of the Course	Mathematical Foundation of Computer Science					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Demonstrate the concepts associated with propositions and mathematical logic. **(K3)**
CO2: Demonstrate the basic concepts associated with relations, functions and their applications. **(K3)**
CO3: Solve recurrence relations using various methods. **(K3)**
CO4: Apply techniques of graphs for real-time problems. **(K3)**
CO5: Construct minimal spanning tree by using different algorithms. **(K3)**

UNIT-I : Mathematical Logic: Statements and Notation , Connectives, Well Formed Formulas ,Truth tables, Tautologies, Equivalence of formulas, Tautological Implications, Normal forms, Theory of inference for Statement Calculus, Indirect Method of Proof. Predicate calculus-Predicates, quantifiers, universe of discourse.

UNIT-II: Set Theory and Relations: Operations on Sets, Principle of Inclusion and Exclusion, Relations, Properties of Binary Relations in a set, Transitive Closure, Relation Matrix and Digraph, Equivalence, Partial Ordering Relations, Hasse Diagrams, Lattice and its Properties, Functions, Bijective Functions, Composition of Functions.

UNIT-III: Recurrence relations: Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, Solution of Inhomogeneous Recurrence Relation.

UNIT-IV: Graph Theory: Basic Concepts of graph, Representing graphs, Sub graphs, Isomorphic graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Planar graphs, Graph Coloring, Chromatic Number. (Theorems without proofs)

UNIT-V: Trees: Spanning Trees, minimal Spanning Trees, BFS, DFS, Kruskal's Algorithm, Prim's Algorithm, Binary trees, Planar Graphs.

Text Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, 1st Edition, Tata McGraw Hill.
2. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H.Rosen, 7th Edition, Tata McGraw Hill.
3. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.

Reference Books:

1. Elements of Discrete Mathematics -A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
2. Discrete Mathematics with Combinatorics and Graph Theory, Santha, 1st Edition Cengage Learning.

Semester	III	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST03
Name of the Course	OOPs Through C++					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Differentiate Procedural Oriented Programming and Object-Oriented Programming. **(K2)**
CO2: Develop programs using Classes and Objects. **(K3)**
CO3: Demonstrate Constructors, destructors & Operator-Overloading. **(K3)**
CO4: Construct Classes using inheritance and Exceptions. **(K3)**
CO5: Demonstrate Files and Generic Programming. **(K3)**

UNIT-I: Introduction to Object-Oriented Programming – Programming Paradigms, Data Types, Variables, Constants, Operators,Decision Statements &Control Structures, Arrays, Namespace, Default Arguments, Constant Arguments, Parameter passing techniques, Features of Object-Oriented Programming.

UNIT-II: Introduction to Classes and Objects :Defining Classes & Objects, Access specifiers, Scope Resolution Operator, Static Member variables, Static Member Functions, Array of Objects. Inline Functions, Overloading Member Functions, Objects as Function Arguments, Friend Functions, Friend Class, Local Class, Empty Class, Nested Classes, Return by Reference.

UNIT-III: Introduction to Constructors: Characteristics, Constructor with Default Arguments, Parameterized Constructors, Overloading Constructors, Copy Constructor, Dynamic Constructors and Destructors, Anonymous Objects. Introduction to operator Overloading, Rules for Overloading Operators, Overloading Unary & Binary Operators, this keyword, Constraint on Increment and Decrement Operators, Overloading with Friend Functions, Type Conversions.

UNIT-IV: Inheritance: Base class and Derived class, Single Inheritance, Multiple Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Classes, Constructor in Derived Classes. qualifier classes, Significance of Virtual Functions, Early Vs Late Binding, Pure Virtual Functions, Virtual Destructor. **Exception handling:** Principles of Exception Handling, Keywords, Exception Handling Mechanism, Multiple Catch Statements, Catching Multiple Exceptions, Re-throwing Exception.

UNIT-V: Files: File Opening Modes, File Stream Classes, I/O manipulators, Classes for File Handling, Sequential Access Files, Random Access Files, Error Handling Functions.
Generic Programming with Templates: Need for Templates, Class Templates, Function Templates , overloading Template Functions. Introduction to Standard Template Library, Sequential Containers & Associative Containers.

Text Books:

1. Programming in C++, Ashok N Kamthane, 2nd Edition, Pearson.
2. C++ How to Program, Paul J. Deitel, Harvey Deitel, 6th Edition, PHI publication.

Reference Books:

1. Object Oriented Programming C++, Joyce Farrell, Cengage.
2. Mastering C++, Venugopal, Raj Kumar, Ravi Kumar, TMH.
3. The Complete Reference C++, Herbert Schildt, 4th Edition, Mcgraw Hill.
4. Object Oriented Programming With C++, R. Subburaj, Vikas Publishing House.

Semester	III	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST04
Name of the Course	Data Structures					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Illustrate the time and space complexities for searching and sorting algorithms. **(K2)**

CO2: Demonstrate linked lists and their applications. **(K3)**

CO3: Demonstrate Stacks and Queues. **(K3)**

CO4: Illustrate basic operations on binary trees. **(K3)**

CO5: Demonstrate Graphs and their applications. **(K3)**

UNIT-I: Introduction, searching and sorting: Introduction to Data Structures, Types of Data Structures, Performance Analysis: Space complexity, time complexity, asymptotic notation. **Searching:** Linear, Binary and Fibonacci search. **Sorting**: Bubble sort, Selection sort, Insertion sort, radix sort, quick sort, and merge sort.

UNIT-II: Single linked list: Representation of node, operations on single linked list, **Double linked list:** Representation of node, operations on double linked list. **Circular linked List:** Representation of node and its operations.

UNIT-III: Stacks: Definition, Stack ADT, array representation, linked list representation, Towers of Hanoi, infix to postfix conversion, expression evaluation. **Queues:** definition, Queue ADT, Array representation, linked list representation, operations on queues, Applications of Queues, Circular Queue.

UNIT-IV: Trees: Introduction: Terminology, representation of trees, **Binary trees:** abstract data type, Properties of binary trees, binary tree representation, **Tree Traversals:** Inorder, Preorder, Postorder. **Binary search trees:** Definition, searching BST, insert into BST, delete from a BST, Height of a BST.

UNIT-V: Graph: Introduction, definition, types of Graphs, Graph Representation, operations. **Graph Traversal Techniques:** Breadth First Search, Depth First Search **Spanning Trees:** minimum cost spanning tree, Prim's and Kruskal's algorithms, Single source shortest Path and all pair shortest path algorithms.

Text Books:

1. Data Structures, algorithms and applications in C, SartajSahni, Universities press, Second Edition.
2. Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni and Dinesh Mehta, 2nd Edition, Universities Press (India) Pvt. Ltd.

Reference Books:

1. An Introduction to Data Structures with Application, Jean-Paul Tremblay , Paul Sorenson, Second Edition.
2. Fundamentals of Data Structures and algorithms by C V Sastry, Rakesh Nayak, Ch. Raja Ramesh, IK Publications, new Delhi.
3. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
4. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

Semester	III	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST05
Name of the Course	**Computer Organization and Architecture**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Illustrate Basic structure of Computers, Instruction types and their addressing modes. **(K2)**
CO2: Describe the different modes of Input / Output transfer. **(K2)**
CO3: Illustrate different types of Memory. **(K2)**
CO4: Describe the different types of Control Unit techniques. **(K2)**
CO5: Explain the Concepts of Pipelining and Parallel Processing. **(K2)**

UNIT-I: Introduction: Functional Units, Basic Operational Concepts, Bus Structures.
Instruction Sequencing and Addressing Modes: Instructions and Instruction Sequencing, Addressing modes, Basic Input/output Operations.

UNIT-II: Input/output Organization: Accessing Input/output devices, Interrupts- Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses- Synchronous and Asynchronous.

UNIT-III: Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative memory, Cache Memory. (Morris Mano)

UNIT-IV: Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, Microprogrammed Control-Microinstructions, Microprogram Sequencing.

UNIT-V: Pipelining: Basic Concepts, Data Hazards, Instruction Hazards.
Parallelism: Parallel processing challenges – Flynn‘s classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors - Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

Text Books:

1. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 5th Edition, McGraw Hill Education.
2. Computer System Architecture, M. Morris Mano, 3rd Edition, Pearson Education.
3. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.

Reference Books:

1. Computer Organization and Architecture, William Stallings, 10th Edition, Pearson Education.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill Education.

Semester	III	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL03
Name of the Course	**OOPs Through C++ Lab**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: DevelopPrograms onClasses and Objects. (**K3**)
CO2: Demonstrate Constructors, Destructors and Operator-Overloading, Inheritance and Polymorphism. (**K3**)
CO3: Develop programs to handle Exceptions & Files. (**K3**)
CO4: Demonstrate Generic Programming**.** (**K3**)

LIST OF EXPERIMENTS

1. Demonstrate how to debug basic programs using GDB compiler.
2. Develop programs on control structures.
3. Construct programs for following concepts.
   a) Default Arguments b) Constant Arguments c) Reference Arguments
4. Construct programs for following concepts.
   a) Classes & Objects b) Inline functions c) Static Member functions
   d) Overloading of Member Functions
5. Develop programs for following concepts.
   a) Objects as Function Arguments b) Friend Functions, Friend class c) Local class
   d) Empty Class& Nested Classes
6. Develop programs for following concepts.
   a) Default constructor b) Constructor with arguments c) Copy constructor
7. Construct programs for following concepts.
   a) Binary b) Unary c) new d) delete
8. Construct programs for following concepts.
   a) Single b) Multilevel c) Hierarchical d) Hybrid
9. Demonstrate the use of Virtual Functions &Virtual Base class.
10. Develop programs to handle following Exceptions.
    a) Division-by-zero b) Overflow in an array
11. Develop programs for following file handling operations.
    a) Copying text files b) Displaying the contents of the file
12. Demonstrate Class template and Function Template.
13. Demonstrate Sequential Containers & Associative Containers.

Text Books:

1. Programming in C++, Ashok N Kamthane, 2nd Edition, Pearson.
2. C++ How to Program, Paul J. Deitel, Harvey Deitel, 6th Edition, PHI publication.

Semester	III	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL04
Name of the Course	Data Structures Lab					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Construct Programs on Sorting and Searching Techniques. **(K3)**

CO2: Illustrate Various Operations On Linked Lists. **(K3)**

CO3: Develop Programs On Stacks, Queues and Their Applications. **(K3)**

CO4: Develop Various Operations on Trees and Graphs. **(K3)**

LIST OF EXPERIMENTS

1. Practice following Sorting Techniques

   (A)Selection Sort (B) Quick Sort (C)Merge Sort
2. Practice following Searching Methods

   (A)Linear Search (B) Binary Search.
3. Develop program for Single Linked List and Its Operations. (Create, Insert, Delete, Display)
4. Develop program for Double Linked List and Its Operations.
5. Construct Stack along with their operations using Arrays.
6. Construct Queue along with their operations using Arrays.
7. Develop Circular Queue using Arrays.
8. Construct Queue along with their operations using Single Linked List.
9. Construct Binary Search Tree and Its Operations using double linked list.
10. Demonstrate Depth First Search and Breadth First Search Algorithm.
11. Develop Minimum Spanning Tree using Prim's Algorithm.
12. Develop Minimum Spanning Tree Kruskal's Algorithm.

Text books:

1. Data Structures, algorithms and applications in C++, SartajSahni, Universities press, Second Edition.
2. Fundamentals of Data Structures in C++, Ellis Horowitz, SartajSahni and Dinesh Mehta, 2nd Edition, Universities Press (India) Pvt. Ltd.

Reference Books:

1. An Introduction to Data Structures with Application, Jean-Paul Tremblay , Paul Sorenson, Second Edition.
2. Fundamentals of Data Structures and algorithms by C V Sastry, RakeshNayak, Ch. Raja Ramesh, IK Publications, new Delhi.
3. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
4. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

Semester	III	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL05
Name of the Course	**Linux Shell Scripting Lab**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Demonstrate the basic knowledge of Linux commands and utilities by using Linux shell environment. **(K3)**

CO2: Experiment with the Concept of shell Programming on Files and Directories. **(K3)**

CO3: Experiment with the Concept of shell Programming on File Permissions. **(K3)**

CO4: Experiment with the Concept of shell Programming on Conditional Statements. **(K3)**

CO5: Experiment with the Concept of shell Programming on Looping Statements. **(K3)**

LIST OF EXPERIMENTS

1. Experiment the following Unix Commands:
   a) **General Purpose Utilities:** cal, date,man,who.
   b) **Directory Handling Commands:** pwd,cd,mkdir,rmdir.
   c) **File Handling Utilities:** cat,cp,ls,rm,nl,wc
   d) **Displaying Commands:** head, tail
   e) **Filters:** cmp,comm.,diff,sort,uniq
   f) **Disk Utilities:** du,df
2. Develop a Shell Program to Display all the words which are entered as command line arguments.
3. Develop a shell script that Changes Permissions of files in PWD as rwx for users.
4. Develop a shell script to print the list of all sub directories in the current directory.
5. Develop a Shell Program which receives any year from the keyboard and determine whether the year is leap year or not. If no argument is supplied the current year should be assumed.
6. Develop a shell script which takes two file names as arguments-If their contents are same then delete the second file.
7. Develop a shell script to print the given number in the reversed order.
8. Develop a shell script to print first 25 Fibbonacci numbers.
9. Develop a shell script to print the Prime numbers between the specified range.
10. Develop a shell script to delete all lines containing the word 'unix' in the files supplied as arguments.
11. Develop a shell script Menu driven program which has the following options.
    i) contents of /etc/passwd
    ii) list of users who have currently logged in.
    iii) present working directory. iv) exit.

Text Books:

1. UNIX and Shell Programming: A Textbook, Behrouz A. Forouzan | Richard F. Gilberg, Cengage Learning.
2. UNIX: Concepts and Applications, Sumithaba Das, 4th Edition, Tata McGrawHill.
3. Unix & Shell Programming, M.G.Venkatesh Murthy, Pearson Education.
4. UNIX shells by example, 4th Edition Ellie Quigley, Pearson Education.

Semester	III	L	T	P	C	COURSE CODE
Regulation	V20	2	0	0	0	V20ENT02
Name of the Course	**Professional Communication Skills – I**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Use vocabulary in regular chores of life with accuracy, make meaningful sentences, and describe people and their traits vividly. **(K3)**

CO2: Distinguish between places of pilgrimage and holiday spots; describe incidents, things and process; and frame questions, statements and expressions. **(K4)**

CO3: Demonstrate their knowledge of idioms which are similar to those of native speakers while speaking and writing and use phrases clearly and precisely to articulate their views that compare and contrast indianisms with native expressions and avoid common errors. **(K3)**

CO4: Employ the vocabulary of netizens with ease and walk through the letters and emails for effective official correspondence and infer the accurate meaning of the homophones that are often confusing. **(K3)**

CO5: Summarize their profile; introduce themselves as well as others by incorporating their accomplishments and Sketch stories and anecdotes in an interesting and engaging manner that arouses curiosity of the audience. **(K5)**

UNIT – I:BUILDING VOCABULARY FOR DAILY ACTIVITIES NAMES: Things- Kitchen Utensils – Occupation- tools – spices- vegetables –flowers - sciences of study – Professions. Framing Questions – statements – expressions related to the Vocabulary taught.
PEOPLE: Describing people -Physical characteristics,-Mental attributes – various professions Framing Questions – statements – expressions related to the Vocabulary taught.
ACTIVITY: Related to the topics learnt in Unit – 1

UNIT – II: BUILDING VOCABULARY FOR PLACES, THINGS & PROCESS PLACES: Describing favorite place – famous place- Places of Pilgrimage.
THINGS: Describing a thing- Describe an incident or an event.
PROCESS: Describe a process –Recipe – experiment –Entrance test application.
Framing Questions – statements – expressions related to the Vocabulary taught.
ACTIVITY: Related to the topics learnt in Unit – II.

UNIT – III: NATIVE EXPRESSIONS – Idioms and Phrases – in day to day activities for different occasions - Usage written & spoken –
PHRASES with as—as expressions – used to compare & contrast
COMMON MISTAKES- in spoken & written
INDIANISMS- Most often used expressions – accepted in India – found place in Dictionary
ACTIVITY: Related to the topics learnt in Unit – III

UNIT –IV: NET VOCABULARY: Acronyms and abbreviations that are most often used
HOMOPHONES : Words often confused – Spelling & Pronunciation
Letter Writing : Formal& Informal- Letters for all occasions
Email Writing : Business mails – project status mails – informative mails
ACTIVITY : Related to the topics learnt in Unit – IV

UNIT –V SELF-INTRODUCTION: Basic information - Academic and personal - interests– strengths and weaknesses – goal. **PROFILE BUILDING:** Resume writing – CV Building – Types
STORYTELLING WITH CREATIVITY: Reading and Narrating a story – narrating anecdotes
ACTIVITY : Related to the topics learnt in Unit – V

Reference Books:

1. Lewis Norman, Word Power Made Easy (2008). Goyal Publishers & Distributors Pvt. Ltd.
2. Sunita Mishra &C.Muralikrishna, Communication Skills for Engineers (2006). Dorling Kindersley (India) Pvt. Ltd., licensees of Pearson Education in South Asia.
3. Chaturvedi PD &ChaturvediMukesh, Business Communication (2006). Dorling Kindersley (India) Pvt. Ltd., licensees of Pearson Education in South Asia.
4. Joshi Manik, Popular English Idioms and Phrases: English Idiomatic Expressions (2013).
5. Joshi Manik, Homonyms, Homophones and Homographs: Vocabulary Building (2014).
6. Gupta S.C. A Handbook for Letter Writing (2018).Arihant Publishers
7. Lisa McGrimmon, The Resume Writing Guide: A Step-by-Step Workbook for Creating a Winning Resume (2013). CareerChoiceGuide; 2nd edition.
8. Sawhney, Clifford. Improve your Word Power (2013). V&S Publishers

Web References: (NET Vocabulary)

1. https://www.grammarly.com/blog/texting-abbreviations/
2. https://www.slicktext.com/blog/2019/02/text-abbreviations-guide/
3. https://www.webopedia.com/reference/text-abbreviations/

Semester	IV	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST06
Name of the Course	Design and Analysis of Algorithms					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Demonstrate asymptotic notation and divide and conquer technique. **(K3)**
CO2: Use greedy technique to solve various problems. **(K3)**
CO3: Demonstrate dynamic programming technique to various problems. **(K3)**
CO4: Develop algorithms using backtracking technique. **(K3)**
CO5: Demonstrate branch and bound technique to various problems. **(K3)**

UNIT-I: Introduction: What is an Algorithm, Algorithm Specification-Pseudo code Conventions Recursive Algorithms, Performance Analysis-Space Complexity, Time Complexity, Asymptotic Notation, Practical Complexities, Performance Measurement.
Divide and Conquer: General Method, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort-Performance Measurement,

UNIT-II: The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees-Prim's Algorithm, Kruskal's Algorithms, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT-III: Dynamic Programming: All Pairs Shortest Paths, Single Source Shortest paths General Weights, Explain Optimal Binary Search Trees, String Edition, 0/1 Knapsack, Reliability Design.

UNIT-IV: Backtracking: The General Method, 8-Queens Problem, Sum of Subsets, Graph Coloring, and Hamiltonian Cycles.

UNIT-V: Branch and Bound: The Method-Least cost (LC) Search, The 15-Puzzle: an Example, Control Abstraction for LC-Search, Bounding, FIFO Branch-and-Bound, LC Branch and Bound, 0/1 Knapsack Problem-LC Branch-and Bound Solution, FIFO Branch-and-Bound Solution, Traveling Salesperson. Basic Concepts of NP-hard and NP-complete problems.

Text Books:

1. Fundamentals of computer algorithms E. Horowitz S. Sahni, University Press.

Reference Books:

1. Introduction to Algorithms Thomas H. Cormen, PHI Learning.
2. The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D.Ullman.
3. Fundamentals of Data Structures and algorithms by C V Sastry, Rakesh Nayak, Ch. Raja Ramesh,
   Distributed by WILEY publications, New Delhi.
4. Algorithm Design, Jon Kleinberg, Pearson.

Semester	IV	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST07
Name of the Course	**Software Engineering**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Demonstrate the Software Development life cycle Models. **(K3)**

CO2: Illustrate the Requirements engineering process and SRS document. (**K3)**

CO3: Develop the Software Architecture and Design Modeling. **(K3)**

CO4: Apply the Coding & Testing techniques and Risk management strategies. **(K3)**

CO5: Describe Project estimation techniques and Quality Management& Metrics. **(K2)**

UNIT-I: Software and Software Engineering: The Nature of Software, Software Engineering, Software Process, Software Engineering Practice, Software Myths. **Software process models:** Waterfall model, Prototyping, Iterative development, Unified process, RAD model, Spiral model, and agile process.

UNIT-II: Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, SRS document. **Requirements engineering process:** Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

UNIT-III: Software Architecture: Role of software architecture, Architecture views, components and connector view, Cohesion and Coupling, documenting architecture design. **Design:** Design concepts, Function-oriented design, object-oriented design, UML diagrams, and Data flow diagram.

UNIT-IV: Coding and Testing: Programming principles and guidelines, incrementally developing code. Testing concepts, testing process, Black-box & White-box testing. **Risk management**: Reactive vs. Proactive Risk strategies, Software risks, Risk identification, Risk projection, Risk refinement, RMMM Plan.

UNIT-V: Software Project Estimation& Maintenance: Decomposition techniques, Empirical Estimation Models, Maintenance Process, Reengineering, Configuration Management. Metrics for Products & Quality Management: Software Measurement, Metrics for software quality, Quality concepts, Software Reviews, Formal technical reviews, SEI-CMM Model, Six Sigma and ISO 9000 quality standards.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S.Pressman, 7th Edition, McGrawHill International Edition.
2. Software Engineering- Ian Sommerville, 9th Edition, Pearson education.Software Engineering, A Precise approach, PankajJalote, Wiley

Reference Books:

1. CMMI and Six Sigma: Partners in Process Improvement, Jeannine M. Siviy,M. Lynn Penn, Robert W. Stoddard, 1st edition, Addison Wesley;
2. Software Engineering principles and practice, WSJawadekar, 3rdEdition,TMH.

Semester	IV	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST08
Name of the Course	**Database Management Systems**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe Database systems, various Data models and Database architecture. **(K2)**

CO2: Develop various real time applications using Relational algebra and Relational calculus. **(K3)**

CO3: Apply various Normalization techniques to refine schema. **(K3)**

CO4: Explain Transaction management and Concurrency control. **(K2)**

CO5: Illustrate various Database indexing techniques. **(K2)**

UNIT-I: An Overview of Database Systems: Managing data, File systems verses DBMS, Advantages of DBMS, Data models, Levels of abstraction in a DBMS, Data independence, Structure of a DBMS, Client/Server Architecture, E.F.Codd Rules. **Database Design:** Database design and ER Diagrams, Entities, Attributes, Entity sets, Relationships and Relationship sets, Conceptual design with ER Models.

UNIT-II: Relational Model: Integrity constraints over relations, Key constraints, Foreign key constraints, General constraints, Enforcing integrity constraints, Querying relational data
Relational Algebra: Selection and Projection, set operation, renaming, Joins, Division, Introduction to Views, destroying/altering Tables and Views. **Relational Calculus**: Tuple Relational Calculus, Domain Relational Calculus.

UNIT-III: SQL Queries, Constraints and Triggers: The Form of Basic SQL Query, Union, Intersect, Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and active data bases. **Schema Refinement (Normalization):** Problems caused by redundancy, Decompositions, purpose of Normalizion, Schema refinement, Concept of functional dependency, Normal forms based on functional dependency (1NF, 2NF and 3NF), Concept of Surrogate key, Boyce-Codd Normal Form (BCNF), Lossless Join and Dependency preserving decomposition, Fourth Normal Form(4NF).

UNIT-IV: Transaction Management: Transaction, Properties of Transactions, Transaction Log, and Transaction management with SQL commit, rollback and save point.
Concurrency Control: Concurrency Control for Lost updates, Uncommitted data, Inconsistent retrievals and the Scheduler. **Concurrency Control with Locking Methods :** Lock granularity, Lock types, Two phase locking for ensuring serializability, Deadlocks, Concurrency control with Time stamp ordering, Transaction recovery.

UNIT-V: Storage and Indexing: Overview of Storages and Indexing, Data on external storage, File organization and indexing, Clustered indexing, Primary and secondary indexes, Index data structures, Hash based indexing, Tree based indexing, Comparison of file organization

Text Books:

1. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, 3rd Edition TATA McGraw Hill.
2. An Introduction to Database Systems, C.J Date,A.Kannan,S.JSwamynathan 8th Edition, Pearson Education

Reference Books:

1. Database Systems-Design, Implementation and Management, Peter Rob &Carlos Coronel 7th Edition, Course Technology Inc.
2. Fundamentals of Database Systems, RamezElmasri,Shamkant B. Navathe ,7th Edition, Pearson Education.
3. Database Systems - The Complete Book, Hector Garcia- Molina, Jeffry D Ullman, Jennifer Widom, 2nd Edition, Pearson.

Semester	IV	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST09
Name of the Course	**Java Programming**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe Java Virtual Machine and Type casting. **(K2)**

CO2: Demonstrate Concepts like Constructors, Arrays, Nested Classes and Command Line Arguments. **(K3)**

CO3: Implement Concepts of Inheritance and Exception Handling. **(K3)**

CO4: Develop programs on Multi-Threading and Files. **(K3)**

CO5: Implement Event Handling and Swings. **(K3)**

UNIT-I: Introduction to Java: Introduction to Object Oriented Paradigm, Concepts of OOP, Applications of OOP, History of Java, Java Features, JVM, Program Structure. Variables, Primitive Data Types, Constants, String class, Primitive type conversion and Casting, Control Structures.

UNIT-II: Classes and Objects: Classes and objects, Class declaration, Creating objects, Methods, Constructors and Constructor Overloading, Importance of Static Keyword and Examples, this Keyword, Arrays, Command Line Arguments, Nested Classes, Garbage Collector.

UNIT-III: Inheritance and Exception Handling: Inheritance, super Keyword, final Keyword, Method Overriding and Abstract Class. Interfaces, Creating Packages, Using Packages, Importance of Class path. Exception Handling, Importance of try, catch, throw, throws and finally Block.

UNIT-IV: Multithreading and Files: Introduction, Thread Lifecycle, Creation of Threads, Thread Priorities, Thread Synchronization, Communication between Threads. Reading Data from Files and Writing Data to Files, Random Access Files.

UNIT-V: Event Handling and Swings: Introduction to AWT and Applets. Swings: Introduction, Components, Button, Label, Checkbox, List Boxes, Menu and Scrollbar, Layout Managers.
Event Handling : Event Delegation Model, Sources of Events, Event Listeners, Adapter Classes.

Text Books:

1. Java Programming, E. Balagurusamy, 4th Edition, TMH.
2. The complete Reference Java, 8th Edition, Herbert Schildt,TMH.
3. Introduction to java programming, Y Daniel Liang, 7 Edition,Pearson.

Reference books:

1. Core Java: An Integrated Approach , R Nageswara Rao, 7thEdition, Dream Tech
2. Head First Java , Kathy Sierra and Bert Bates, 2nd Edition O'reilly

Semester	IV	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20MAT04
Name of the Course	**Probability and Statistics**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Find the Expectation of Random variables. **(K3)**

CO2: Apply probability distribution to real time problems. **(K3)**

CO3: Plot a best fit curve to an experimental data and find the correlation and regression. **(K3)**

CO4: Create good estimators to various parameters. **(K3)**

CO5: Apply the principles of Statistical Inference to practical problems. **(K3)**

UNIT-I: Random Variables and Expectation: Random Variables: Discrete and continuous - Probability function – density and distribution function, Expectation of a Random Variable, Moments, Chebychev's Inequality (Without proof).

UNIT-II: Probability Distributions: Probability distributions: Binomial, Poisson and Normal - Evaluation of statistical parameters: Mean, Variance and their properties, Introduction to Exponential, Gamma and Weibull distributions

UNIT-III: Bivariate Distributions: Curve fitting by the method of Least squares- Fitting of straight line, parabola and exponential curves, Simple Correlation and Regression – Rank correlation.

UNIT-IV: Sampling Distribution and Estimation: Introduction –Sampling distribution of means with known and unknown standard deviation. **Estimation:** Criteria of a good estimator, point and interval estimators for means and proportions.

UNIT-V: Tests of Hypothesis: Introduction-Type-I, Type-II Errors, Maximum Error, one–tail, two-tail tests, Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means. Test of significance: Small sample test for single mean, difference of means and test of ratio of variances (F-Test) - Chi-square test for goodness of fit and independence of attributes.

Text Books:

1. **B. V. Ramana**, A text Book of Engineering Mathematics, Tata McGraw Hill.
2. **Miller & Freund's**, Probability & Statistics for Engineers – Eighth Edition, Richard. A. Johnson

References Books:

1. **S. Ross,** "A First Course in Probability", Pearson Education India, 2002.
2. **Dr.T.S.R.Murthy**, Probability and Statistics for Engineers, BS Publications.
3. **T. Veerarajan**, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.

Semester	IV	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL06
Name of the Course	**Statistical Visualization using R Lab**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Employ math and simulation in R. **(K2)**
CO2: Demonstrate various types of data structures in R. **(K3)**
CO3: Apply appropriate control structures to solve a particular Programming problem. **(K3)**
CO4: Use R to graphically visualize data and results of statistical calculations. **(K3)**

LIST OF EXPERIMENTS

1. Demonstrate the basic math functions in R.
2. Demonstrate Vector operations in R.
3. Demonstrate Matrix operations in R.
4. Demonstrate Array operations in R.
5. Demonstrate Data frames in R.
6. Demonstrate Lists in R.
7. Illustrate the following controls statements in R.
   a. if and else b. ifelse c. switch
8. Demonstrate for and while loops in R.
9. Demonstrate importing and exporting data using R.
10. Illustrate the descriptive statistics using summary() in R.
11. Demonstrate the following statistical distribution functions in R:
    a. Normal Distribution
    b. Binomial Distribution
    c. Poisson Distribution
    d. Chi Square Distribution
12. Illustrate the following basic graphics in R:
    a. Bar plots
    b. Pie Charts
    c. Histograms
    d. Kernel density plots
    e. Boxplots
    f. Dotplots
13. Illustrate the Correlation and Covariance analysis using R.
14. Illustrate the different types of t-tests using R.
15. Illustrate the ANOVA test using R.

Text Books:

1. R for Everyone, Jared P Lander, Pearson
2. R in Action,Rob I Kabacoff, Manning

Reference Book:

1. The Art of R Programming, Norman Matloff, No Starch Press

Semester	IV	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL07
Name of the Course	**Data Base Management Systems Lab**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1:	Construct SQL queries to perform different database operations.	**(K3)**
CO2:	Experiment with various constraints and Database Indexing Techniques.	**(K3)**
CO3:	Construct PL/SQL Cursors and Exceptions.	**(K3)**
CO4:	Develop PL/SQL Functions, Procedures and Packages.	**(K3)**
CO5:	Apply basic operations on collections of Mongo DB database.	**(K3)**

LIST OF EXPERIMENTS

Part-A

1. Construct SQL queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions.
2. Construct SQL queries using Operators.
3. Construct SQL queries to Retrieve and Change Data : Select, Insert, Delete and Update.
4. Construct SQL queries using GroupBy, OrderBy and Having Clauses.
5. Construct SQL queries on Controlling data: commit, rollback and save point.
6. Construct report using SQL*PLUS.
7. Construct SQL queries for Creating, Dropping and Altering Tables, Views and Constraints.
8. Construct SQL queries on Joins and Correlated Subqueries.
9. Demonstrate Index, Sequence and Synonym.
10. Demonstrate Controlling access, locking rows for update and security features.

PL/SQL

11. Demonstrate Basic Variables, Anchored Declarations, and Usage of Assignment Operation Using PL SQL block.
12. Demonstrate Bind and Substitution Variables using PL SQL block.
13. Demonstrate Control Structures in PL SQL.
14. Demonstrate Cursors, Exception and Composite Data Types in PL SQL.
15. Demonstrate Procedures, Functions, and Packages in PLSQL.

Part-B

1. Demonstrate the installation of Mongo DB database.
2. Demonstrate Creating and dropping database, collection in Mongodb.
3. Demonstrate Insertion, updation and deletion operations in Mongodb database.
4. Construct queries for Projection, limiting records, sorting records and aggregation in Mongodb database.

Textbooks:

1. OracleDatabase11gTheCompleteReferencebyOraclePress,Kevin Loney
2. DatabaseSystemsUsingOracle,NileshShah,2ndEdition, PHI.
3. Introduction to SQL, RickFVanderLans, 4thEdition, Pearson Education.

Reference Books:

1. OraclePL/SQLInteractiveWorkbook,B.RosenzweigandE.Silvestrova,2ndEdition, Pearsoneducation.
2. SQL&PL/SQLforOracle10 g,BlackBook, Dr.P.S.Deshpande, DreamTech.

Semester	IV	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL08
Name of the Course	**Java Programming Lab**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Demonstrate Programs on Classes, Objects, Constructors and Arrays. **(K3)**

CO2: Demonstrate Inheritance and Exception Handling. **(K3)**

CO3: Implement programs on Multi-Threading and File Handling. **(K3)**

CO4: Implement Event handling using Swings. **(K3)**

LIST OF EXPERIMENTS

1. Develop programs on Control Structures and Type Conversions in java.
2. Develop programs using various String handling functions.
3. Construct programs using the following concepts:
   a) Classes & Objects b) Usage of static c)Constructors
4. Construct programs using the following concepts.
   a) Arrays b) Nested Classes c) Command Line Arguments
5. Construct programs using the following concepts.
   a) Inheritance b) Usage of super c)Method Overriding
6. Construct programs using the following concepts.
   a) Usage of final b) Abstract class c)Interfaces
7. Implement the programs using the concepts
   a) Packages b) Exception Handling.
8. Implement the programs on Multi-Threading.
   a) Multiple Threads on Single Object b) Thread Deadlock
9. Construct a program that shows Inter-thread Communication.
10. Construct programs to perform read and write operations on files.
    a) Sequential Files b) Random Access files
11. Develop GUI using Swings.
12. Construct programs on Event Handling using Listener Interfaces.

Text Books:

1. The complete Reference Java, 8th Edition, Herbert Schildt, TMH.
2. Introduction to java programming, Y Daniel Liang, 7 Edition, Pearson.

Semester	IV	L	T	P	C	COURSE CODE
Regulation	V20	2	0	0	0	V20ENT03
Name of the Course	**Professional Communication Skills – II**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Demonstrate grammatical competence, analyze noun and pronoun dispositions, classify various kinds of verbs, adjectives and adverbs and identify errors in sentences; distinguish the subtle meanings of various words in different contexts, recognize similar words as well as words with contrast meanings and use them appropriately. **(K3)**

CO2: Organize individual words into one whole sentence using new vocabulary and focus on the error analysis of prepositions and conjunctions, build conversations which befit the situations and develop pre-reading strategies to improve comprehension skills. Distinguish and acquire knowledge of using words of the same category in a sentence and learn new words that promote communicative finesse. Find errors in sentences where the modifiers are misplaced and put them at the appropriate place, use hit pair words and send an email that is concise and lucid. **(K3)**

CO3: Recognize the easiest and best possible way of solving problems in the area of Number and Letter Series, Analogy, Classification, Coding & Decoding Symbols, Ranking and Analytical Reasoning. **(K4)**

CO4: Investigate the different types of logics involved in Mirror and Water Images, Logical Reasoning & Arithmetic Reasoning. **(K4)**

CO5: Find the common traps in the questions and errors likely to be made from the concepts of Blood Relations, Directions, Average, Clock and Calendar, Data Sufficiency, Permutations-Combinations and Probability. **(K3)**

UNIT – I:- ERROR ANALYSIS: Nouns & Pronouns – Singular & Plural – Kinds of Nouns & Pronouns - Collective Nouns - Personal and Reflexive Pronouns. Subject – Verb agreement. Adjectives – Adverbs – role of modifiers – place of Adjectives– Adverbs of frequency.

VOCABULARY : Word Power Made Easy Sessions 15- 30, Antonyms and Synonyms and One word substitutes

EXPANSION OF PROVERBS: Meaning – interpretation – explanation**.**

UNIT – II:- ERROR ANALYSIS: Prepositions - kinds of prepositions –appropriate use - conjunctions –sub- ordinating– coordinating.

ROLE PLAY: Day to day situations - practical approach – real life experiences.

READING COMPREHENSION: Reading as a skill – quick reading - analyzing – answering - Skimming – scanning - summarizing – problem solving.

ERROR ANALYSIS: Parallel grammatical forms – same grammatical structures. Dangling modifiers – misplacement of modifiers – arrangement.

SENTENCE IMPROVEMENT: Better choice – error-free sentences – effective – syntax**.**

EMAIL WRITING: Format – method of exchanging – technicalities.

UNIT – III:-Number And Letter Series, Coding & Decoding, Analogy, Classification Ranking. (K1)

Problems of how to find the next number in the series, Finding the missing number and related sums, Sums related to Classification, Sums related to letter series, Relation between number series and letter series, Finding odd one out from groups, Identify the rank in different places.

UNIT-IV:- Problems On Ages& Numbers, Mirror And Water Images, Logical Reasoning & Arithmetic Reasoning.(K4)

Definition and concept of Venn Diagram – its applications. statements – Affirmations, Denials and Contradictions. Sums related to Ages & numbers. Problems on ages with different logics. Identifying the images of water and Mirror.

UNIT-V:- Blood Relations, Directions, Average, Clock And Calendar, Data Sufficiency, Permutations- Combinations And Probability.(K3)

Deriving the formula to find the angle between hands for the given time, History of calendar-, Finding the day for the given date, Problems related to directions. Difference between words Permutation and Combinations – Various cases - Real Time Scenarios. Concept of Probability – Conjunctions – Rules & Cases of Probability.

References:

1. VermaShalini.Common Errors In English (2016).S Chand & Company
2. Sharon Weiner Green M.A&Ira K. Wolf Ph.D.Barron's GRE (2015). Barrons Educational Series
3. Paul D.S. Advanced English Grammar with Answers (2007) Published by Cambridge University Press..
4. Work book -1 on Aptitude Prepared by T & P cell, Sri Vasavi Engineering College.
5. Kundan& Tyra. Magical Book on Quicker Maths(20013). Published by Tyra &Kundan
6. Kundan&Tyra.Practice Book on Quicker Maths (2009). Published by Tyra &Kundan
7. R.S. Agarwal .Non Verbal Reasoning.Sultan Chand Publications

Web References:

1. https://www.indiabix.com/
2. https://www.campusgate.co.in/
3. https://www.questionpaper.org/

Semester	V	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST10
Name of the Course	**Operating Systems**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe Operating System Services and System Calls. **(K2)**
CO2: Illustrate Process Management Concepts and CPU Scheduling Algorithms. **(K3)**
CO3: Demonstrate Process Synchronization primitives and Process Deadlocks. **(K3)**
CO4: Illustrate Memory Management Techniques and Page Replacement Algorithms. **(K3)**
CO5: Describe File System Concepts and Mass Storage Structures. **(K2)**

UNIT-I: Introduction: Operating-System Structure, Operating-System Services, User and Operating System Interface, System Calls, Types of System Calls.

UNIT-II: Process Management: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication. **Threads:** Overview, Multithreading Models
CPU Scheduling: Basic Concepts**,** Scheduling Criteria**,** Scheduling Algorithms.

UNIT-III: Process Synchronization: The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors. **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT-IV: Memory Management: Main Memory: Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table.
Virtual Memory: Introduction, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

UNIT-V: Storage Management: Overview of Mass-Storage Structure, Disk Scheduling, File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Allocation Methods.

Text Books:

1. Operating System Concepts**,** Abraham Silberschatz, ,Peter Baer Galvin,Greg Gagne, 9th Edition, John Wiley and Sons Inc., 2012.

Reference Books:

1. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2012 .
2. Modern Operating Systems, Andrew S. Tanenbaum, Third Edition, Addison Wesley, 2007.

Semester	V	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST11
Name of the Course	**Data Mining**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Explain the concept of Data Mining and its functionalities. **(K2)**
CO2: Discuss various Data Preprocessing Techniques. **(K3)**
CO3: Demonstrate Association Analysis Techniques. **(K3)**
CO4: Illustrate various Classification Techniques. **(K3)**
CO5: Use different Clustering techniques to cluster data. **(K3)**

UNIT-I: Introduction: Need for Data Mining, Knowledge Discovery from Data, Kinds of Data mined, Kinds of Patterns mined, Technologies used, Kinds of Applications targeted, Major Issues in Data Mining, Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity.

UNIT-II: Data Preprocessing: Overview of Data Preprocessing, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT-III: Mining Frequent Patterns, Associations, and Correlations: Basic Concepts, Frequent Itemset Mining Methods- Apriori Algorithm: Finding Frequent Itemsets by Confined Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, Pattern-Growth Approach for Mining Frequent Itemsets.

UNIT-IV: Classification: Basic Concepts, Decision Tree Induction, Attribute Selection Measures, Tree Pruning. **Bayes Classification Methods:** Bayes' Theorem, Naive Bayesian Classification.
Bayesian Belief Networks: Concepts and Mechanisms.

UNIT-V: Cluster Analysis: Basic Concepts and Methods, Partitioning Methods, Hierarchical Methods, Density Based Method-DBSCAN.

Text Books:

1. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian Pei,3rd Edition, Morgan Kaufmann Publishers.

.

Reference Books:

1. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, 1st Edition, Pearson Education Inc.
2. Data Mining and Analysis,Mohammed J Zaki, Wagner Meira JR, 1st Edition ,Cambridge University Press.

Semester	V	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST12
Name of the Course	**Web Technologies**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Illustrate the basic concepts of HTML and CSS. . **(K2)**
CO2: Illustrate Extensible markup language and XML parsers. **.** **(K3)**
CO3: Develop web applications using JDBC. . **(K3)**
CO4: Build database driven web applications using JSP. **(K3)**
CO5: Illustrate the basic concepts of Angular and NODE JS. **(K2)**

UNIT-I: HTML :Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Frames Forms.
CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, Property value forms, Font Properties, List Properties, color, Alignment of Text

UNIT-II: Working with XML: Introduction, The syntax of XML, XML Document Structure, Document type Definition (DTD), Namespaces, XML schemas, XSLT, **XML Parsers** - DOM and SAX

UNIT-III: WORKING WITH DATABASE: Getting started with JDBC , Defining ODBC, Introduction to JDBC, Components of JDBC, JDBC Architecture, Types of Drivers, Working with JDBC APIs, Creating a Simple Application, Working with Prepared Statement.

UNIT IV: Introduction to Servlets & JSP: Introduction to servlets, Life cycle of Servlet, Limitations of servlets, Java Server Pages: JSP Overview, Components of a JSP Page: Directives, comments, Expressions, Scriptlets , Declarations, implicit objects, Database Access, session tracking.

UNIT V: Fundamentals of NODE JS and Angular : Understanding Node.js, Installing Node.js, Working with Node Packages, Creating a Node.js Application, Understanding Angular, Modules, Directives, Data Binding, Dependency Injection, Services, Creating a Basic Angular Application.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2. Node.js, MongoDB and Angular Web Development, 2nd Edition,Brad Dayley Brendan Dayley Caleb Dayley,Pearson Education,2018
3. JSP:The Complete reference,Phil Hanna,The McGraw-Hill Copanies,2001.
4. JDBC, Servlets, and JSP, New Edition, Santhosh Kumar K, Kogent Learning Solutions Inc, Dreamtech Press, 2018.

Reference Books:

1. Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
3. Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.

Semester	V	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE01
Name of the Course	**Software Testing Methodologies (Professional Elective-I)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe Software testing objectives and methodology. **(K2)**

CO2: Apply various Software testing techniques. **(K3)**

CO3: Discuss Static testing techniques for software testing. **(K2)**

CO4: Distinguish Software testing and debugging process. **(K2)**

CO5: Explain modern Software testing tools to Support software testing. **(K2)**

UNIT-I: Introduction to Software Testing: Evolution of software Testing, Myths and Facts, Goals of software Testing, Definitions of Testing, Model for Software Testing, Software Testing Terminology, Software Testing Life Cycle.

UNIT-II: Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, Verification of High level and low level designs, How to verify code, Validation. **Dynamic Testing I:** Black Box testing techniques: Boundary Value Analysis, Equivalence Class Testing, Decision Table based Testing,

UNIT-III: Dynamic Testing II: White-Box Testing: Need of White-Box Testing, Logic coverage criteria, Basis path testing, Loop testing. **Static Testing:** Inspections, Structured Walkthroughs, Technical reviews.

UNIT-VI: Regression Testing: Progressive Vs Regressive Testing, Regression testability, Objectives of regression testing, When is Regression Testing done? Regression Testing Types, Regression testing techniques. **Debugging:** Debugging process, Techniques, correcting bugs.

UNIT-V: Software Quality Management: Software quality concept, Quality control and Quality Assurance, Software Quality metrics. **Automation and Testing Tools:** Need for automation, categorization of Testing tools, selection of testing tools, Overview of some commercial testing tools.

Text Books:

1. Software Testing, Principles and Practices, Naresh Chauhan, 9th Edition, Oxford Publisher.

Reference Books:

1. Software testing techniques - Boris Beizer, 2nd Edition, Dreamtech publisher.
2. Foundations of Software testing, Aditya P Mathur, 2nd ed, Pearson.
3. Software Testing- Yogesh Singh, CAMBRIDGE.

Semester	V	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE02
Name of the Course	**Principles of Programming Languages (Professional Elective-I)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe syntax and semantics of programming languages. **(K2)**
CO2: Explain data types and basic statements of programming languages. **(K2)**
CO3: Design and implement subprogram constructs. **(K3)**
CO4: Discuss concurrency process using OOP. **(K2)**
CO5: Develop programs in Scheme, ML, and Prolog. **(K3)**

UNIT-I: Syntax and semantics: Evolution of programming languages, describing syntax, context, free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive – decent bottom - up parsing

UNIT-II: Data, Data types, and basic statements: Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and boolean expressions , assignment statements , mixed mode assignments, control structures – selection, iterations, branching, guarded Statements

UNIT-III: Subprograms and implementations: Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping.

UNIT- IV: Object- orientation, concurrency, and event handling: Object – orientation, design issues for OOP languages, implementation of object, oriented constructs, concurrency, semaphores, Monitors, message passing, threads, statement level concurrency, exception handling.

UNIT- V:Functional programming languages: Introduction to lambda calculus, fundamentals of functional programming languages, Programming with Scheme, Programming with ML, Logic programming languages: Introduction to logic and logic programming, Programming with Prolog, multi - paradigm languages

Text Books:

1. Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Addison Wesley, 2012.
2. Programming Languages, Principles & Paradigms, 2ed, Allen B Tucker, Robert E Noonan, TMH

Reference Books:

1. R. Kent Dybvig, "The Scheme programming language", Fourth Edition, MIT Press, 2009.
2. Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Prentice Hall, 1998.
3. Richard A. O'Keefe, "The craft of Prolog", MIT Press, 2009.
4. W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard",5th Edition, Springer, 2003

Semester	V	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE03
Name of the Course	**Artificial Intelligence (Professional Elective-I)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss the foundations of AI. **(K2)**

CO2: Identify Search Strategies for Problem Solving. **(K2)**

CO3: Illustrate Adversarial Search for Game Playing. **(K2)**

CO4: Discuss Reasoning approaches. **(K2)**

CO5: Illustrate Knowledge Representation approaches. **(K2)**

UNIT-I: Introduction: What is AI? The Foundations of Artificial Intelligence, History of Artificial Intelligence, The State of the Art Applications.
Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT-II: Solving Problems by Searching: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems.

UNIT-III: Adversarial Search : Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions, Stochastic Games, Partially Observable Games, State-of-the-Art Game Programs, Alternative Approaches.

UNIT-IV: Knowledge and Reasoning: Propositional Logic, Propositional Theorem Proving, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Forward Chaining, Backward Chaining, Resolution.

UNIT-V: Knowledge Representation: Representations and Mappings, Approaches to Knowledge Representation-Simple Relational Knowledge, Inheritable Knowledge, Inferential Knowledge, Procedural Knowledge, Issues in Knowledge Representation, The Frame Problem.

Text Books:

1. Artificial Intelligence : A Modern Approach, Stuart J. Russell and Peter Norvig, 3rd Edition, Prentice Hall.
2. Artificial Intelligence, Elaine Rich,Kevin Knight, Shivashankar B Nair, 3rd Edition,Tata McGraw-Hill.

Reference Books:

1. Artificial Intelligence, George F Luger, Pearson Education Publications.
2. Artificial Intelligence, Saroj Kaushik, 1st Edition, Cengage Learning.

Semester	V	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE04
Name of the Course	Computer Graphics (Professional Elective-I)					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss the applications of computer graphics and learn basic algorithms. **(K2)**

CO2: Discuss the concepts of 2D graphics along with transformation techniques. **(K2)**

CO3: Demonstrate3D graphics and 3D object representation. **(K3**)

CO4: Discuss different visible surface detection methods and color models. **(K2)**

CO5: Illustrate different animation sequences. **(K2)**

UNIT-I: Introduction: Application of Computer Graphics, raster scan systems, random scan systems, raster scan display processors. Output Primitives : Points and lines, line drawing algorithms(Bresenham's and DDA Line derivations and algorithms), mid-point circle algorithms. **Filled area primitives:** Boundary-fill and flood-fill algorithms.

UNIT-II: 2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, and homogeneous coordinates, composite transforms.**2-D viewing:** The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland line clipping, Sutherland–Hodgeman polygon clipping algorithm.

UNIT-III: 3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations. **3-D object representation:** Polygon surfaces, quadric surfaces, spline representation, Bezier curve and B-Spline curves.

UNIT-IV: Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, BSP tree methods, area sub-division. **Color Models** – RGB, YIQ, CMY, HSV.

UNIT-V: Computer Animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems**,** motion specifications.

Text Books:

1. Computer Graphics C version, Donald Hearn, M.Pauline Baker,Pearson
2. Computer Graphics, Schaum's outlines", Zhigandxiang,RoyPlastock, 2nd Edition,TataMc-Graw HillEdition.

Reference Books:

1. Computer Graphics Principles & practice, 2/e, Foley, VanDam, Feiner, Hughes,Pearson
2. Computer Graphics, Peter, Shirley, CENGAGE
3. Principles of Interactive Computer Graphics, Neuman ,Sproul,TMH.

Semester	V	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL09
Name of the Course	**Data Mining Lab**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Demonstrate Data Preprocessing techniques. **(K3)**
CO2: Demonstrate Association Rule Mining techniques. **(K3)**
CO3: Demonstrate Classification techniques. **(K3)**
CO4: Demonstrate the Clustering techniques. **(K3)**

LIST OF EXPERIMENTS (Weka Tool)

1. Demonstrate Data Preprocessing on predefined Weka dataset labor.arff
2. Create a student.arff dataset and Demonstrate Data Preprocessing on it
3. Demonstrate Association rule process on predefined Weka dataset contact lenses.arff using apriori algorithm.
4. Create an employee.arff dataset and demonstrate Association rule process on it using apriori algorithm
5. Demonstrate Classification process on student.arff dataset using j48 algorithm
6. Create a customer.arff dataset and demonstrate Classification process on it using j48 algorithm
7. Demonstrate Classification process on employee.arff dataset using id3 algorithm
8. Demonstrate Classification process on employee.arff dataset using Naïve Bayes algorithm
9. Demonstrate Clustering process on predefined Weka dataset iris.arff using simple k-means algorithm.
10. Demonstrate Clustering process on dataset student.arff using simple k- means algorithm.

Reference Books:

1. Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank, Mark A. Hall, 3rd Edition, Morgan Kaufmann Publishers.
2. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, Jian Pei, 3rd Edition, Morgan Kaufmann Publishers.
3. Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, 1st Edition, Pearson Education Inc.

Semester	V	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL10
Name of the Course	**Web Technologies Lab**					
Branch	Common to CSE & CST					

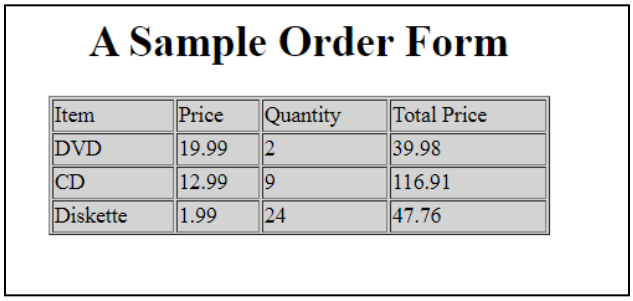
Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Illustrate the basic concepts of HTML and CSS. **(K2)**
CO2: Illustrate Extensible markup language and XML parsers**.** **(K3)**
CO3: Develop web applications using JDBC. **(K3)**
CO4: Build database driven web applications using JSP. **(K3)**
CO5: Illustrate the basic concepts of Angular and NODE JS. **(K2)**

LIST OF EXPERIMENTS

Exercise 1: Design HTML fundamental constructs.
(i) Headings (ii) Links (iii) Paragraph (iv) Images (v) Tables
Exercise 2: Design HTML fundamental constructs.
(i) Frames (ii) Forms and HTML controls
Exercise 3: Design Cascading style sheets
(i) Internal (ii) External (iii) Inline
Exercise 5: Write an XML file which will display the Book information which includes the following:
(i) Title of the book (ii) Author Name (iii) ISBN number (iv) Publisher name
(v) Edition (vi) Price
(a) Write a Document Type Definition (DTD) to validate the above XML file.
(b) Write a XML Schema Definition (XSD).
Exercise 6: Create a simple JSP to print the current Date and Time.
Exercise 7: Develop JSP program calculates factorial values for an integer number, while the input is taken from an HTML form.
Exercise 8: Develop JSP program shows a Sample Order Form.



Exercise 9: Create JSP to insert, delete, and update the details of student into the database using JDBC connectivity.
Exercise 10: Design a simple Angular JS form.
Exercise 11: Design a simple Node JS application.

Reference Books:

1. Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning
3. Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.

Semester	V	L	T	P	C	COURSE CODE
Regulation	V20	2	0	0	0	V20ENT04
Name of the Course	**Professional Communication Skills – III**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Distinguish the subtle meanings of various words in different contexts, recognize similar words as well as words with contrast meanings and use them appropriately. Express writer's tone and relevant ideas using different types of writing skills and prepare resume to showcase skills and accomplishments. Organize thoughts in the discussions and express views without reticence. Develop the ability to write different types of essays in a structured way, maintaining cohesion and logic. (**K4)**

CO2: Identify the central theme and arrange the scrambled sentences into a meaningful passage. Draft emails with appropriate subject-lines and relevant content. Compare different pairs of words, recognize the relationship between the head words and the options to siphon correct analogy Choose an appropriate word to make a sentence meaningful. Infer the meaning of the picture by thinking out of the box and speak without inhibitions and face interviews with aplomb. (**K2)**

CO3: Analyze appropriate methods of logical thinking on Ratio and Proportion, Partnership, LCM and HCF, Number System, Areas & Volumes. (**K4)**

CO4: Demonstrate problem solving skills through the concepts of Percentages, Profit and loss, Simple Interest & Compound Interest and Allegation. (**K3)**

CO5: Calculate the end results of Cubes, Dice and Data Analysis, Time & Work, Time & Distance, Race & Games. (**K4)**

UNIT – I: VOCABULARY – MODEL RESUMES & SPEAKING

500 words (PIC-VOC) -Meaning – contextual Usage - Prefix – Suffix – Root words. Resume writing-Model Resume-Introducing different formats-Tailoring resume as per job description. Paragraph writing-Essay writing- Types of Essays- Strategies – Cause and effect signals – support signals – contrast signals. Watch a video and respond

Group Discussion – Types of GD – Dos & Don'ts , JAM , Presentation Skills, Designing Advertisements

UNIT – II: GRAMMAR, WRITING & SPEAKING SKILLS

Tenses – Simple – Continuous – perfect – perfect continuous - voice – Active & Passive -Para jumbles – Strategies – Directional words – central theme-Email writing– Types -- Dos and Don'ts- **VERBAL ABILITY- ANALOGIES- INTERVIEW SKILLS- CREATIVE THINKING ANALOGIES:** Strategies - Recognize common relationship types. Synonyms – Antonyms - Create a general sentence - Use the correct part of speech - Beware of homonyms. Equalizing the sentences- scrambled sentences. Interview Skills – Personal Interview – Skype Interview – Telephone Interview – Mock Interviews. Creative thinking – Picture Interpretation -Creative writing

UNIT – III: Ratio & Proportion, Partnership, LCM & HCF and Areas & Volumes

Introducing the concept of ratio in three different methods, a method to compute and compare two ratios – The effect of increase or decrease of a quantity on the ratio – The meaning of proportion and Problems related to Ratio and Proportion. Improve problem solving skills through Lcm & Hcf.

UNIT – IV: Percentages, Profit and Loss, Simple and Compound Interest, Allegation & Mixtures

Definition of Simple and Compound Interest. Formulas of Applications – Difference between Simple and Compound interest – Rate of Increase or Decrease Population – Expected values of Maturity. Calculate percentages on different situations, using in profit and loss. Identifying difference between Cost price, Selling Price and Marked Price, Finding Discounts, using the method of allegation.

UNIT – V: **Time, Work and Distance, Cubes, Dice and Data Analysis**

Men- Days -work –completion- Capability Ratio among Men, Women and Children – Application of time in Pipes and Cistern. Work Progress in positive and negative effects. Relation among Time, Speed and Distance – Concepts of Relative speed and Average Speed – Ideas about Boats and Streams and Races of Games. Calculate the end results of Cubes and Dice.

References:

1. Dr.Sujani Tata et al., Pic Voc (2015) – Published by Sri Vasavi Engineering College
2. Lewis Norman, Word Power Made Easy (2008). Goyal Publishers & Distributors Pvt. Ltd.
3. Dr.Shalini Verma, Reetesh Anand, Word Power Made Handy(2017). S Chand Publications.
4. R S Aggarwal,Objective General English (2017). S Chand Publications.
5. Sunita Mishra & C.Muralikrishna, Communication Skills for Engineers (2006). Dorling Kindersley (India) Pvt. Ltd., licensees of Pearson Education in South Asia.
6. Charles W Hanson. Resume: Writing 2020 The Ultimate Guide to Writing a Resume that Lands YOU the Job! (2019).
7. Raymond Murphy. Essential Grammar in Use (1985).Cambridge University Press
8. Seely John. The Oxford Guide to Writing & Speaking (2004). Oxford University Press.
9. Jain,T.S. & Gupta. , 2010, Interviews and Group Discussions, Upkar's Publications.
10. Training & Placement cell, 2020, Workbook -1 on Aptitude, Sri Vasavi Engineering College.
11. M Tyra, 2013, Magical Book on Quicker maths, BSC Publications.
12. K Kundan & M Tyra, 2009, Practice Book on Quicker Maths, BSC Publications.
13. Dr. RS. Agarwal , 2017, Quantitative Aptitude, Sultan Chand Publications
14. Dr. RS. Agarwal, 2017, A modern approach to verbal & on verbal reasoning, Sultan Chand Publications.

Web References:

1. https://www.indiabix.com/
2. https://www.campusgate.co.in/
3. https://www.questionpaper.org/

Semester	VI	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST13
Name of the Course	**Computer Networks**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss fundamentals of network concepts and Reference Models. **(K2)**
CO2: Discuss Communication media and switching techniques. **(K2)**
CO3: Demonstrate Error control and Data link layer protocols. **(K3)**
CO4: Apply Routing algorithms and congestion control algorithms. **(K3)**
CO5: Discuss Transport layer protocols and Application layer protocols. **(K2)**

UNIT-I: Introduction: Reference models: The OSI Reference Model- the TCP/IP Reference Model, Examples ofNetworks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.

UNIT-II: Physical Layer: Transmission Media, Multiplexing: FDM, WDM and TDM- LAN Technologies, introduction to switching: Circuit Switched Networks, Datagram Networks, and Virtual Circuit Networks.

UNIT–III: Data link layer: Design issues, Framing, Flow control, error control, error detection - Parity bit, CRC, Checksum, error correction- Hamming code. MAC: ALOHA, CSMA. Elementary Data Link Layer protocols: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel. Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, HDLC, point to point protocol (PPP).Piggybacking.

UNIT-IV: Network Layer : Network layer design issues- Algorithm shortest path routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical routing, Broad cast, Multi cast Routing algorithms-Congestion control and algorithms, Internet Protocol (IP) Addresses, Subnet masking. Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

UNIT–V: Transport Layer: Services, Primitives and sockets, Elements of transport protocols, Internet Transport protocols(TCP,UDP,RPC,RTTP/RTP,RTCP) Segment headers, Primitives, Control, Congestion control.
Application layer: DNS, SMTP, POP,FTP HTTP Presentation formatting. Network security: Cryptography, DES Public key and RSA private key cryptography Algorithms.

Text Books:

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
2. Data Communications and Networks – Behrouz A. Forouzan.Third Edition TMH

Reference Books:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

Semester	VI	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST14
Name of the Course	**Machine Learning**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Explain the Basics of Machine Learning. **(K2)**

CO2: Demonstrate Classification and Clustering Techniques. **(K3)**

CO3: Construct Decision Trees and Random Forest. **(K3)**

CO4: Illustrate the Working of Neuron and Perceptron Algorithm. **(K2)**

CO5: Demonstrate the working of Multi-Layer Perceptron algorithm. **(K3)**

UNIT-I: Introduction: Learning**:** Machine Learning, Types of Machine Learning, Supervised Learning: Classification & Regression, The Machine Learning Process, Weight Space, The Curse of Dimensionality, Overfitting, Training, Testing, Validation Sets, The Confusion Matrix, Accuracy, ROC Curve, Unbalanced Datasets, Measurement Precision, Thae Bias-Variance Tradeoff.

UNIT-II: Classification: The General Problem, Probabilistic Classifiers: The Bayes Classifier, Logistic Regression, Non-Probabilistic Classifiers: K-Nearest Neighbors, Support Vector Machines, Assessing Classification Performance: Accuracy-0/1 Loss, Sensitivity, Specificity. **Clustering**: The General Problem, K-Means Clustering.

UNIT-III: Learning With Trees: Using Decision Trees, Constructing Decision Trees: Entropy in Information Theory, ID3 Algorithm, CART-Gini Impurity. **Ensemble Learning:** Boosting: Adaboost, Stumping; Bagging, Random Forests.

UNIT-IV: Neuron & Neural Network: The Brain And The Neuron: Hebb's Rule, McCulloch and Pitts Neuron and Its Limitations, Neural Networks, The Perceptron: The Learning Rate, Bias Input, The Perceptron Learning Algorithm, Linear Separability, Linear Regression.

UNIT-V: Multi-Layer Perceptron: Going Forward: Biases, Back-Propagation and Error, The Multi-Layer Perceptron Algorithm, Initializing the Weights, Activation Functions, Sequential and Batch Training, Local Minima, Picking up momentum, Minibatches and Stochastic Gradient Descent, The Multi-Layer Perceptron In Practice: Amount of Training Data, Number of Hidden Layers, When to Stop Learning.

Text Books:

1. Machine Learning: An Algorithmic Perspective, Stephen Marsland, 2nd Edition, CRC Press.
2. A First Course in Machine Learning, Simon Rogers & Mark Girolami, 2nd Edition, CRC Press.

Reference Books:

1. Machine Learning, Tom Mirchel,Mcgraw Hill.
2. Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Peter Flash, Cambridge University Press.

Semester	VI	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CST15
Name of the Course	**Automata and Compiler Design**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Construct Finite Automata and Regular Expressions. **(K3)**

CO2: Describe the Compilation Process and Lexical Analysis. **(K2)**

CO3: Construct Top down and Bottom up Parsing Techniques. **(K3)**

CO4: Produce Intermediate Code Generation and Runtime Environments**.** **(K3)**

CO5: Explain Code Optimization and Code Generation. **(K2)**

UNIT I: Formal Language and Regular Expressions: Alphabet, Strings, Language, Finite Automaton-Design of DFA, Design of NFA, Equivalence between NFA and DFA, Finite Automata with ϵ-Transition, Equivalence between NFA and ϵ-NFA. **Regular Expression**: Regular expressions Equivalence between Regular Expressions and Finite Automata ,Chomsky Hierarchy.

UNIT II: Compiler: Definition, Structure of a compiler. **Lexical Analysis**: The Role of the Lexical Analyzer, Specification of Tokens, Recognition of Tokens and the Lexical-Analyzer Generator-Lex. **Context Free grammars**: Context free grammars, derivation, parse trees, Ambiguous Grammar, Writing a Grammar-Elimination of Left Recursion, Left Factoring.

UNIT III: Top Down Parsing: First and Follow, LL(1) Grammars, **Bottom-Up Parsing**: Bottom Up Parser Classification, Reductions, Handle Pruning, Shift-Reducing, Constructing SLR Parsing Tables, construction of CLR (1), LALR Parsing tables, Comparison of all Bottom Up approaches.

UNIT IV: Semantic Analysis: Syntax Directed Definitions, Evaluation Orders for SDD‘s
Intermediate Code Generation: Variants of Syntax Trees, Three-Address Code, Basic blocks and Flow graphs, Control Flow. **Run-Time Environments:** Storage Organization, Stack Allocation of Space, Heap Management

UNIT V: Code optimization: Machine Independent Optimization. The principle sources of Optimization, optimization of Basic blocks, peep hole Optimization, Introduction to Date flow Analysis.
Code generation: Issues in design of code generation, The target Language, Address in the target code, A Simple Code generation.

Text Books:

1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwaniand J.D.Ullman, 3rdEdition, Pearson, 2008.
2. Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education.

Reference Books:

1. Louden: “Compiler Construction, Principles & Practice”, 1st Edition, Thomson Press, 2006.
2. Tremblay J P, Sorenson G P: “The Theory & Practice of Compiler writing”, 1st Edition, BSP Publication, 2010.
3. Theory of Computation, V. Kulkarni, Oxford University Press, 2013.

Semester	VI	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE05
Name of the Course	**Object Oriented Software Engineering (Professional Elective-II)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe Software process and different life cycle models. **(K2)**
CO2: Discuss Project Planning, and organization. **(K2)**
CO3: Apply OO concepts along with their applicability contexts. **(K3)**
CO4: Demonstrate object oriented analysis and design. **(K3)**
CO5: Describe Implementation, Integration and Maintenance phases. **(K2)**

UNIT I: Introduction to Classical software Engineering: Introduction to OO Paradigm. Different phases in structured paradigm and OO Paradigm. Software Process and different life cycle models and corresponding strengths and weaknesses.

UNIT II: Planning and Estimation: Estimation of Duration and Cost, COCOMO components of software. Project Management plan. Planning Object-Oriented Projects. Project Organization & communication concepts and their activities.

UNIT III: Modules to objects: Cohesion and Coupling, Data Encapsulation and Information hiding aspects of Objects. Inheritance, Polymorphism and Dynamic Binding aspects. Cohesion and coupling of objects. Reusability, Portability and Interoperability aspects. Introduction to testing, with focus on Utility, Reliability, Robustness, Performance, Correctness.

UNIT IV: Requirement phase: Rapid Prototyping method, Specification phase, Specification Document, Formal methods of developing specification document, Examples of other semi - formal methods of using Finite-State- Machines, Petri nets and E- Language.
Analysis phase: Use case Modeling, Class Modeling, Dynamic Modeling, Testing during OO Analysis.

UNIT V: Design phase: Data oriented design, Object Oriented design, and Formal techniques for detailed design. Challenges in design phase. **IIM Phases:** Implementation, Integration and maintenance phases, OOSE aspects in these phases.

Text Books:

1. Object oriented and Classical Software Engineering, **7/e**, Stephen R. Schach, TMH
2. Object oriented and classical software Engineering, Timothy Lethbridge, Robert Laganiere, TMH, Second Edition.

Reference Books:

1. Component-based software engineering: 7th international symposium, **CBSE 2004**, IvicaCrnkovic, Springer.

Semester	VI	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE06
Name of the Course	**Advanced Data Structures (Professional Elective-II)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Explain external sorting method. **(K2)**
CO2: Discuss pattern matching Algorithms. **(K2)**
CO3: Illustrate various hash functions with appropriate examples. **(K3)**
CO4: Illustrate various priority queues with appropriate examples. **(K3)**
CO5: Construct self-balanced tree with appropriate examples. **(K3)**

UNIT-I: Sorting: Introduction - External Sorting- K-way Merging - Buffer Handling for parallel Operation Run Generation- Optimal Merging of Runs.

UNIT-II: String Matching Algorithms: The Navi String matching algorithms – The Robin-Krap algorithm – String Matching algorithm using finite automata – The Knuth Morris Pratt algorithm.

UNIT-III: Hashing: Dictionaries –-Hash Table Representation: Ideal hashing – Hash functions and tables - Linear probing- Hashing with Chains
Priority Queues (HEAPS): Definition and Applications – ADT – Linear lists – Heaps : Definition – Max heap and Min heap operations, Applications – Heap Sort – Huffman Codes.

UNIT-IV: Efficient Binary Search Trees :ADT-Introduction to AVL Trees- Red-Black Trees- Definition Representation of a Red- Black Tree- Searching a Red-Black Tree- Inserting into a Red Black Tree- Deletion from a Red-Black Tree- Joining Red-Black Trees, Splitting a Red-Black tree – Splay Trees – Introduction – operation – Amortized complexity.

UNIT-V: Multi way Search Trees : ISAM - M-Way Search Trees, Definition and Properties Searching an M-Way Search Tree, B-Trees, Definition and Properties- search Elements in a B-tree Insertion into B-Tree- Deletion from a B-Tree- Node Structure.

Text Books:

1. Data Structures, Algorithms and Applications in C++; SartajSahni; UniverstiyPress ; 2 nd Edition.
2. Introduction to Algorithms By Thomas H Cormen, Charless E leiserson, Ronald L Rivest and Cliford Stein PHI publication Third Edition (UNIT – II)

References:

1. Data Structures, a Pseudocode Approach, Richard F Gilberg, BehrouzAForouzan, Cengage.
2. An Introduction to Data Structures with applications By Jean Paul Trembly and Paul G Sorenson Tata McGraw Hill Second Edition
3. Fundamentals of Data Structures and algorithms by C V Sastry, RakeshNayak, Ch. Raja Ramesh, IK Publications, new Delhi.

Semester	VI	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE07
Name of the Course	Data Science (Professional Elective-II)					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss the fundamental concepts of Data Science. **(K2)**

CO2: Illustrate Exploratory Data Analysis. **(K2)**

CO3: Explain the Concepts of Recommendation Engines. **(K2)**

CO4: Explain various Anomaly Detection Techniques. **(K2)**

CO5: Discuss Feature Selection techniques. **(K2)**

UNIT-I: Introduction:AI, Machine Learning and Data Science, What is Data Science? Case for Data Science, Data Science Classification, Data Science Algorithms.
Data Science Process: Prior Knowledge, Data Preparation, Modeling-Training and Testing Datasets, Learning Algorithms, Evaluation of the Model, Ensemble Modeling, Application, Knowledge.

UNIT-II: Data Exploration: Objectives of Data Exploration, Datasets- Types of Data, Descriptive Statistics-Univariate Exploration, Multivariate Exploration, Data Visualization, Roadmap for Data Exploration.

UNIT-III: Recommendation Engines: Need, Applications, Concepts, Types, Collaborative Filtering-Neighborhood-Based Methods, Matrix Factorization; Content-Based Filtering- Building an Item Profile, User Profile Computation, Implementation Steps, Hybrid Recommenders.

UNIT-IV: Anomaly Detection: Concepts - Causes of Outliers, Anomaly Detection Techniques; Distance-Based Outlier Detection- Working, Implementation Steps; Density-Based Outlier Detection- Working, Implementation Steps; Local Outlier Factor- Working, Implementation Steps.

UNIT-V: Feature Selection: Classifying Feature Selection Methods, Principal Component Analysis, Information Theory-Based Filtering, Chi-Square-Based Filtering, Wrapper-Type Feature Selection-Backward Elimination.

Textbook:

1. Data Science Concepts and Practice, Vijay Kotu, BalaDeshpande, 2nd Edition, Morgan Kaufmann Publishers.

Reference Books:

1. An Introduction to Data Science, Jeffrey S. Saltz,Jeffrey M. Stanton, Sage Publications.
2. The Art of Data Science, Roger D Peng, Elizabeth Matsui, Lean Publishing.
3. Data Science for Business, Foster Provost, Tom Fawcett,O'Reilly Media.

Semester	VI	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE08
Name of the Course	Cryptography and Network Security (Professional Elective-II)					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss fundamentals and mathematical support of Cryptography and Network Security. **(K2)**
CO2: Discuss symmetric and asymmetric cryptosystems. **(K2)**
CO3: Discuss about HASH functions & Digital Signatures to provide authentication and integrity. **(K2)**
CO4: Demonstrate various methods of Mutual trust and mail security**.** **(K3)**
CO5: Review the Network& Internet Security Scenarios. **(K2)**

UNIT-I: Overview: Security attacks, Services, Mechanisms, A model for network security, Symmetric cipher model. **Classical encryption techniques**: Substitution Techniques, Transposition Techniques. **Number Theory**: Prime numbers, Fermat's theorem, Euler's Theorem, the Chinese Remainder Theorem.

UNIT-II: Block Cipher: Principles, DES, Strength of DES, AES, Block cipher Modes of Operations.
Public Key Cryptography: Principles, Public Key Crypto system, RSA Algorithm, Diffie Hellman Key Exchange.

UNIT-III: Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, SHA-512, Message Authentication Functions, Requirements, HMAC.
Digital Signatures: Properties, Attacks and Forgeries, Requirements, Digital Signature Standards, NIST Digital Signature Algorithm.

UNIT-IV: Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Asymmetric Key Distribution Using Symmetric Encryption, Distribution of Public Keys, X.509 Certificates. **User Authentication**: Remote User Authentication Principles, Kerberos. **Electronic Mail Security:** Pretty Good Privacy (PGP) And S/MIME.

UNIT-V: IP Security: Two modes, two security protocols Authentication Header, Encapsulating Security Payload. **Transport Level Security:** Secure Socket Layer (SSL) and Transport Layer Security (TLS). **HTTPS:** Connection Initiation Connection Closure.

Text Books:

1. William Stallings, "Cryptography and Network Security, Principles and Practices", Pearson Education, Sixth Edition.
2. Cryptography and Network Security, Behrouz A Forouzan, Debdeep Mukhopadhyay, (3e) Mc Graw Hill.

Reference Books:

1. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security – Private Communication in a Public World" Pearson/PHI.

Semester	VI	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL11
Name of the Course	**Computer Networks Lab**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Implement Error detection technique and Sliding window protocol. (**K3)**
CO2: Implement Routing and congestion control Algorithms. (**K3)**
CO3: Implement socket programming. (**K3)**

LIST OF EXPERIMENTS
(Implement using C/C++/Java/Python)

1. Study of basic network commands and Network configuration commands.
    a) Ping
    b) Tracert / Traceroute
    c) Ipconfig / ifconfig
    d) Hostname
    e) Nslookup
    f) Netstat
2. Construct Detecting error using CRC-CCITT.
3. Implementation of Bit Stuffing
4. Implementation of Character Stuffing
5. Implementation of stop and wait protocol.
6. Implementation of Dijkstra's algorithm
7. Implementation Distance vector algorithm
8. Implementation of Congestion control using leaky bucket algorithms
9. Implementation using Socket TCP both client and server programs.
10. Implementation using Socket UDP both client and server programs

Text Books:

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI.
2. Data Communications and Networks – Behrouz A. Forouzan.Third Edition TMH.

Reference Books:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.

Semester	VI	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL12
Name of the Course	**Machine Learning Lab using Python**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After successful completion of the course, the student will be able to:

CO1: Identify various Python libraries used in Machine Learning. **(K2)**

CO2: Implement probabilistic classifiers using Python Programming. **(K3)**

CO3: Construct non-probabilistic classifiers using Python Programming. **(K3)**

CO4: Demonstrate the process of clustering using the K-Means algorithm. **(K3)**

CO5: Illustrate the working of a Multi-layer perceptron network. **(K3)**

LIST OF EXPERIMENTS

1. Introduction to required python libraries such as Numpy, Pandas, Scipy, Matplotlib and Scikit-learn.
2. Import, preprocess, and split the datasets using scikit-learn.
3. Construct a classification model using the Bayes classifier using Python Programming.
4. Implement a Logistic Regression algorithm for binary classification using Python Programming.
5. Implement the KNN algorithm for classification and demonstrate the process of finding out optimal "K" value using Python Programming.
6. Construct an SVM classifier using python programming.
7. Demonstrate the process of the Decision Tree construction for classification problems using python programming.
8. Implement an Ensemble Learner using Random Forest Algorithm using python programming.
9. Implement an Ensemble Learner using Adaboost Algorithm using Python programming.
10. Demonstrate the working of Multi-layer perceptron with MLPClassifier() using Python programming.
11. Demonstrate the K-Means algorithm for the given data set using Python programming.

Text Books:

1. Introduction to Machine Learning with Python, Andreas C. Muller and Sarah Guido, First Edition, O'Reilly.

Reference Books:

1. Practical Machine Learning with Python, Dipanjan Sarkar, Raghav Bali and Tushar Sharma, First Edition, A Press.

Semester	VI	L	T	P	C	COURSE CODE
Regulation	V20	0	0	3	1.5	V20CSL13
Name of the Course	**Unified Modeling Language Lab**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Develop Class diagrams. **(K3)**

CO2: Develop Use case diagrams. **(K3)**

CO3: Construct Interaction diagrams. **(K3)**

CO4: Develop State chart, Activity diagrams. **(K3)**

CO5: Develop Component and Deployment diagrams. **(K3)**

LIST OF EXPERIMENTS

1. Draw basic class diagrams to identify and describe key concepts like classes, and their relationships.

2. Draw Use Case diagrams for capturing and representing requirements of the system.

3. Draw sequence diagrams OR communication diagrams with advanced notation for system to show objects and their message exchanges.

4. Draw activity diagrams to display either business flows or like flow charts.

5. Develop State chart diagrams.

6. Draw component diagrams assuming that build the system reusing existing components along with a few new ones.

7. Draw deployment diagrams to model the runtime architecture of system.

8. Design Case study on Library Management System.

9. Design Case Study on Hospital Management System.

10. Design Case study-Railway Reservation System.

Text Books:

1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

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Reference Books:

1. UML 2 Toolkit, Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEY-Dreamtech India Pvt. Ltd.
2. Fundamentals of Object Oriented Design in UML, Meilir Page-Jones, Pearson Education.
3. Modeling Software Systems Using UML2, Pascal Roques, WILEY- Dreamtech India Pvt. Ltd.

Semester	VI	L	T	P	C	COURSE CODE
Regulation	V20	2	0	0	0	V20CEMC02
Name of the Course	**Professional Ethics & Human Values**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss the importance of human values and their context. **(K2)**
CO2: Generalize the professional ethics and norms of engineering practice. **(K2)**
CO3: Review the contextual knowledge of engineering as social experimentation. **(K2)**
CO4: Identify the engineer's responsibility for Safety & Risks. **(K2)**
CO5: Clarify the professional rights & responsibilities at global level. **(K2)**

UNIT I: Human Values: Morals, Values and Ethics – Integrity – Work Ethics – Service Learning –Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing –Honesty –Courage – Value time – Co-operation – Commitment – Empathy –Self-confidence–Spirituality-Character.

UNIT II: Engineering Ethics: The History of Ethics, Purposes for Engineering Ethics, Consensus and Controversy, Professional and Professionalism, Professional Roles to be played by an Engineer –Self Interest, Customs and Religion, Uses of Ethical Theories, Professional Ethics, Types of Inquiry in Engineering Ethics.

UNIT III: Engineering as Social Experimentation: Comparison with Standard Experiments –now ledge gained–Conscientiousness–Relevant Information– Learning from the Past–Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes– odes and Experimental Nature of Engineering.

UNIT IV: Engineers' Responsibility for Safety and Risk: Safety and Risk, Concept of Safety – Types of Risks – Voluntary v/s Involuntary Risk- Short term v/s long term Consequences, Delayed v/s Immediate Risk- Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT V: Engineers' Responsibilities, Rights & Global Issues: Collegiality, Senses of Loyalty, professionalism and Loyalty, Professional Rights & Responsibilities–confidential and proprietary information, Bribes/Gifts, Whistle Blowing. Globalization- Cross-culture Issues, Environmental Ethics, Computer Ethics, Weapons Development Ethicsand Research Ethics, Intellectual Property Rights.

Text Books:

1. "Engineering Ethics and Human Values" by M. Govindarajan, S.Natarajan and V.S.Senthil Kumar-PHILearningPvt.Ltd-2009.
2. "Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications.
3. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran-Laxmi Publications.

References:

1. "Professional Ethics and Human Values"by Prof.D.R.Kiran.
2. "Indian Culture,Values and Professional Ethics"by PSRMurthy-BS Publication.
3. "Ethics in Engineering" by Mike W.Martin and Roland Schinzinger–TMH.

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE09
Name of the Course	**Advanced Computer Architecture (Professional Elective-III)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Explain the different types of parallel computer models. **(K2)**
CO2: Describe various Processor and Memory organizations. **(K2)**
CO3: Illustrate Pipelining, Multiprocessors and Multicomputers concepts. **(K2)**
CO4: Explain Multivector, SIMD Computers and Multithreaded, Dataflow Architectures. **(K2)**
CO5: Illustrate the Parallel Programming models and instruction level parallelism. **(K2)**

UNIT-I: Parallel computer models: The state of computing, Multiprocessors and Multicomputers, Multivector and SIMD computers. **Program and network properties:** Conditions of parallelism, Program flow mechanisms.

UNIT-II: Processors: Advanced Processor Technology, Superscalar and Vector Processors, **Memory Hierarchy, Cache and Shared Memory:** Hierarchical Memory Technology, Virtual Memory Technology, Cache Memory Organizations, Shared-Memory Organizations.

UNIT-III: Pipelining: Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design. **Multiprocessors and Multicomputers:** Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Message Passing Mechanisms.

UNIT-IV: Multivector and SIMD Computers: Vector Processing Principles, Compound Vector Processing. **Scalable, Multithreaded, Dataflow Architectures:** Latency-Hiding Techniques, Principles of Multithreading.

UNIT-V: Parallel Models, Languages: Parallel Programming Models, Parallel Languages and Compilers.**Instruction Level Parallelism:** Problem Definition, Model of a Typical Processor, Compiler-detected Instruction Level Parallelism, Operand Forwarding, Reorder Buffer, Register Renaming, Tomasulo's Algorithm, Branch Prediction.

Text Books:

1. Advanced Computer Architecture: Parallelism, Scalability, Programmability, Kai Hwang, Naresh Jotwani, 2nd Edition, Tata McGraw Hill Education

Reference Books:

1. Computer Organization and Design, David A. Patterson and John. L. Hennessy, 5th Edition, Morgan Kaufmann Series.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill Education.
3. Computer Architecture and Organization: Design Principles and Applications, B. Govindarajulu, 2nd Edition, McGraw Hill Education.

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE10
Name of the Course	BigData Analytics (Professional Elective-III)					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss the challenges of Big Data using Hadoop. **(K2)**

CO2: Apply data modelling techniques to large data sets using map reduce programs. **(K3)**

CO3: Describe the Hadoop I/O classes. **(K2)**

CO4: Examine the use of Pig Framework to work with Big Data. **(K3)**

CO5: Develop a data analytical system using HIVE. **(K3)**

UNIT-I: Introduction to Big Data & Hadoop: What is Big Data, Why Big Data is Important, Data Storage and Analysis, Comparison with other systems. A brief history of Hadoop, Meet Hadoop Data, Apache Hadoop and the Hadoop Ecosystem.

Working with Big Data & HDFS: Google File System, Hadoop Distributed File System (HDFS) –Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker).

UNIT-II: Introducing and Configuring Hadoop cluster: Local distributed mode, Pseudo-distributed mode, Fully Distributed mode, Configuring XML files.

Writing Map Reduce Programs: Analyzing the Data with Hadoop-Map Reduce, Basic programs of Hadoop Map Reduce, Driver code, Mapper code, Reducer code, Record Reader, Combiner functions. Map Reduce Types, Input Format class Hierarchy.

UNIT-III:Hadoop I/O: The Writable Interface, Writable Comparable and Comparators.

Writable Classes: Writable wrappers for Java primitives, Text & Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections.

Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators

UNIT-IV: Pig - Hadoop Programming Made Easier: Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

UNIT-V: Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

Text Books:

1. Hadoop: The Definitive Guide, Tom White, O'Reilly, 3rd Edition, 2012.
2. Hadoop in Action, Chuck Lam, MANNING Publ., 2016.
3. Hadoop for Dummies, Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk, Bruce Brown, Rafael Coss, 2014.

Reference Books:

1. Hadoop in Practice, Alex Holmes, MANNING Publ., 2014.
2. Hadoop Map Reduce Cookbook, Srinath Perera, Thilina Gunarathne, PACKT, 2013.

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE11
Name of the Course	**Deep Learning (Professional Elective-III)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe the fundamentals of deep learning. **(K2)**

CO2: Illustrate the working of deep feed forward neural networks. **(K2)**

CO3: Discuss regularization and optimization techniques used in deep neural networks. **(K2)**

CO4: Illustrate the working of convolution neural networks. **(K2)**

CO5: Explain about recurrent and recursive neural networks. **(K2)**

UNIT-I: Introduction: Historical Trends in Deep Learning**,** The Many Names and Changing Fortunes of Neural Networks, Increasing Dataset Sizes, Increasing Model Sizes, Increasing Accuracy, Complexity and Real-World Impact.

UNIT-II: Deep Feed forward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back Propagation and Other Differentiation Algorithms.

UNIT-III: Regularization for Deep Learning: Parameter Norm Penalties, Early Stopping, Dropout; **Optimization for Training Deep Models:** How Learning Differs from Pure Optimization, Challenges, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Optimization Strategies and Meta-Algorithms.

UNIT-IV: Convolution Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely StrongPrior, Variants of Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks, Convolutional Networks and the History of Deep Learning.

UNIT-V: Sequence Modeling- Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, LSTM and Other Gated RNNs, Explicit Memory.

Textbooks:

1. Deep Learning, Ian Goodfellow, YoshuaBengio, and Aaron Courville, MIT Press.

Reference Books:

1. Neural Networks and Deep Learning, Charu C. Aggarwal, Springer.
2. Fundamentals of Deep Learning, Nikhil Buduma, 1st Edition, O'Reilly

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE12
Name of the Course	**Human Computer Interaction (Professional Elective-III)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe the principles and characteristics of GUI. **(K2)**

CO2: Describe how a computer system may be modified to include human diversity. **(K2)**

CO3: Select an effective style and screen design for a specific business application. **(K2)**

CO4: Discuss System Menus & Navigation Schemes**.** **(K2)**

CO5: Select Device and Screen based controls. **(K2)**

UNIT I:The User Interface: Introduction, Importance of the User Interface, Importance and benefits of Good Design, Characteristics of Graphical and Web User Interface Graphical User Interface, popularity of graphics, concepts of Direct Manipulation, Graphical System advantage and disadvantage, Characteristics of GUI, Characteristics of Web Interface, Principles of User Interface Design.

UNITII:TheUserInterfaceDesignProcess:ObstaclesandPitfallinthedevelopmentProcess,Usability, The Design Team, Human Interaction with Computers, Important Human Characteristics in Design, Human Consideration in Design, Human Interaction Speeds, Performance versus Preference, Methods for Gaining and Understanding of Users.

UNIT III: Understanding Business Functions: Business Definitions& Requirement analysis, Determining Business Functions. **Principles of Good Screen Design:** Human considerations in screen Design, interface design goals, screen meaning and purpose, Technological considerations in Interface Design.

UNIT IV: System Menus and Navigation Schemes: Structure, Functions, Context, Formatting, PhrasingandSelecting,NavigatingofMenus,KindsofGraphicalMenusWindowsInterface:Windowscharacteristic,ComponentsofWindow,WindowsPresentationStyles,TypesofWindows,WindowManagement,

UNITV: Device and Screen-Based Control: Device based controls, Operable Controls, Text entry/read-Only Controls, Section Controls, Combining Entry/Selection Controls Presentation Controls, Selecting proper controls.

Text Books:

1. "The Essential Guide to User Interface Design", Wilbert O. Galitz, 2nd edition,2002,Wiley India Edition.
2. Prece, Rogers, "Sharps Interaction Design", Wiley India.
3. "Designing the user interfaces". Ben Shneidermann 3rd Edition, Pearson Education Asia.

Reference Books:

1. "User Interface Design" , SorenLauesen, Pearson Education
2. "Essentials of Interaction Design", Alan Cooper, Robert Riemann, David Cronin, Wiley
3. "HumanComputer Interaction", Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell, Bealg, Pearson Education.

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE13
Name of the Course	Design Patterns (Professional Elective-IV)					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe the design patterns view and its applications. **(K2)**

CO2: Demonstrate Creational Patterns. **(K3)**

CO3: Construct Structural Patterns for a given Scenario. **(K3)**

CO4: Construct Behavioural Patterns for a given Scenario. **(K3)**

CO5: Examine various Case Studies in utilizing Software Architectures. **(K3)**

UNIT I: Introduction: What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern

UNIT II: Creational Patterns: Abstract factory, Builder, Factory method, Prototype, Singleton.

UNIT III: Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, and PROXY.

UNIT IV: Behavioural Patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

UNIT V: Case Studies A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in Interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development.

Text Books:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education, 1995.

Reference Books:

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006.

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE14
Name of the Course	NOSQL Databases (Professional Elective-IV)					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss four types of NoSQL Databases (Document-oriented, KeyValue Pairs, Column oriented and Graph). **(K2)**

CO2: Illustrate Replication and sharding. **(K2)**

CO3: Explain NoSQL Key/Value databases using MongoDB. **(K2)**

CO4: Demonstrate Column- oriented NoSQL databases using Apache HBASE. **(K3)**

CO5: Explain Graph NoSQL databases using Neo4. **(K3)**

UNIT I: Introduction: Overview and History of NoSQL Databases Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points, Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases.

UNIT II: Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT III: NoSQL Key/Value databases using MongoDB, Document Databases, What Is a Document Database? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, When Not to Use, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT IV: Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, What Is a Column-Family Data Store? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage, When Not to Use

UNIT V: Graph NoSQL databases using Neo4,NoSQL database development tools and programming languages, Graph Databases, What Is a Graph Database? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use

Textbooks:

1. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence , **1st Edition, 2012.** Authors: Sadalage, P. & Fowler, Publication: Pearson Education.
2. The Definitive Guide to MongoDB: A complete guide to dealing with Big Data using MongoDB, **3rd Edition, December, 2015**. Authors: Eelco Plegge, David Hows, Peter Membrey, Tim Hawkins, Apress Publishers

Reference Books:

1. Redmond, E. ,Wilson, Perkins: Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement Edition**: 2nd Edition,2018**, O′Reilly Publishers.

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE15
Name of the Course	**Reinforcement Learning (Professional Elective-IV)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss Elements of Reinforcement Learning and Multi-armed Bandits. **(K2)**
CO2: Illustrate Finite Markov Decision Process and Dynamic Programming. **(K2)**
CO3: Explain Monte Carlo Methods and *n*-step Bootstrapping. **(K2)**
CO4: Explain Off-policy Methods with Approximation. **(K2)**
CO5: Discuss Policy Gradient Methods. **(K2)**

UNIT I: Introduction: Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope. **Multi-armed Bandits:** A k-armed Bandit Problem, Action-value methods, The 10-armed Testbed, Incremental Implementation, Tracking a Non stationary Problem, Optimistic Initial Values, Upper –Confidence-Bound Action Selection, Gradient Bandit Algorithm.

UNIT II: Finite Markov Decision Process: The Agent-Environment Interface, Goals and Rewards, Returns and Episodes, Unified Notation for Episodic and Continuing Tasks, Policies and Value Functions. **Dynamic Programming:** Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming.

UNIT III: Monte Carlo Methods: Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off-policy Prediction via Importance Sampling, Incremental Implementation, Discontinuing-aware Importance Sampling, Per-decision Importance Sampling. ***n*-step Bootstrapping:** *n*-step TD Prediction, *n*-step Sarsa, *n*-step Off-policy Learning, Per-decision methods with Control Variables, A Unifying Algorithm: *n*-step Q(σ).

UNIT IV: Off-policy Methods with Approximation: Semi-gradient Methods, Examples of Off-policy Divergence, The Deadly Triad, Linear Value-function Geometry, Gradient Descent in the Bellman Error, The Bellman Error is not Learnable, Gradient-TD methods, Emphatic-TD methods, Reducing Variance.
Eligibility Traces: The λ-return, TD(λ), *n*-step Truncated λ-return methods, Online λ –return Algorithm, True Online TD(λ), Dutch Traces in Monte Carlo Learning, Sarsa(λ), Variable λ and γ, Off-policy Traces with Control Variables, Watkins's Q(λ) to Tree-Backup(λ).

UNIT V: Policy Gradient Methods: Policy Approximation and its Advantages, The Policy Gradient Theorem, REINFOECE: Monte Carlo Policy Gradient, REINFORCE with Baseline, Actor-Critic Methods, Policy Gradient for Continuing Problems, Policy Parameterization fr Continuous Actions.

Text Books:

1. R. S. Sutton and A. G. Bart,. "Reinforcement Learning - An Introduction," MIT Press, 2018.

Reference Books:

1. Szepesvári, Csaba, "Algorithms for Reinforcement Learning," United States: Morgan & Claypool, 2010.
2. Puterman, Martin L., "Markov Decision Processes: Discrete Stochastic Dynamic Programming," Germany: Wiley, 2014.

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE16
Name of the Course	Cloud Computing (Professional Elective-IV)					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Explain the basic concepts of cloud computing. **(K2)**
CO2: Describe the Virtualization and Migration concepts of Cloud. **(K2)**
CO3: Explain the Cloud Application Design methodologies. **(K2)**
CO4: Illustrate the Security aspects of Cloud. **(K2)**
CO5: Illustrate the SLA Management aspects of Cloud. **(K2)**

UNIT-I: Introduction to Cloud Computing: Definition of Cloud Computing, Layers and Types Of Clouds, Desired Features of a Cloud, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks.

UNIT-II: Cloud Concepts & Technologies: Virtualization, Load Balancing, Replication, Software Defined Networking, Network Function Virtualization (NFV).
Migrating into a Cloud: The Seven-Step Model of Migration into a Cloud, Migration Risks and Mitigation

UNIT-III: Cloud Application Design: Design Considerations for Cloud Applications, Reference Architectures for Cloud Applications, Cloud Application Design Methodologies: SOA, Cloud Component Model, MVC, Data Storage Approaches.

UNIT-IV: Cloud Security: Cloud Security Architecture (CSA), Authentication, Authorization, Identity, Access Management, Data Security, Key Management.

UNIT-V: SLA Management in Cloud Computing: Service Level Agreements (SLA), Traditional Approaches to SLO Management, Types of SLA, Life Cycle of SLA, SLA Management in Cloud.

Text Books:

1. Cloud Computing: Principles and Paradigms,RajkumarBuyya, James Broberg, Andrzej Goscinski, Wiley Publication.
2. Cloud Computing: A Hands-on Approach, ArshdeepBahga, Vijay Madisetti,Universities Press.

Reference Books:

1. Cloud Computing – Web-Based Applications That Change the way you Work and Collaborate Online, Michael Miller, PearsonEducation.
2. Cloud Computing: A Practical Approach,Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw-Hill,(2010).

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE17
Name of the Course	Software Project Management (Professional Elective-V)					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe Software Project Management Terminology. **(K2)**

CO2: Explain various Software development process Models and software Life cycle phases. **(K2)**

CO3: Illustrate various Effort Estimation Techniques and activity network models for Software Project Planning. **(K3)**

CO4: Demonstrate Risk Management Concepts and resource allocation. **(K3)**

CO5: Explain the importance of Project monitoring and control for accomplishing project goals and software Quality. **(K2)**

UNIT-I: Introduction to Software Project Management: Software Project versus other types of projects, Activities covered by Software Project Management, Categorizing projects ,Stakeholders, Objectives& goals, what is management. **Project Planning:** Step-wise planning, Identify Project Scope and objectives, Infrastructure, Project Products &deliverables, Project activities, Effort estimation.

UNIT-II: Project Approach: Build or buy, process models: waterfall model, Prototyping, Incremental delivery model, **Agile methods**: Extreme Programming, Atern method, selecting an appropriate process model. **Lifecycle phases:** Engineering and Production stages, Inception, Elaboration, Construction, Transition phases.

UNIT-III: Software effort estimation and Activity planning: Overview of Effort Estimation techniques, Function Point analysis, COCOMO. **Activity planning:** Objectives, Network planning models, forward pass and backward pass, Identify Critical path and activities.

UNIT-IV: Risk Management and Resource Allocation: Introduction, Risk and its categories, Identification, Assessment, Risk Planning and management, applying PERT technique.
Resource Allocation: Types of Resources, Identifying resource requirements, Resource scheduling.

UNIT-V: Project Monitoring and Control: Creating framework for monitoring& control, Collecting Data, Visualizing Progress, Cost monitoring, Earned value Analysis.
Software Quality: Defining Quality, Importance of quality, ISO 9126, Product QualityVs Process Quality management.
Process Capability Models: Capability Maturity Model, Enhancing software Quality.

Text Books:

1. Software Project Management, Bob Hughes & Mike Cotterell, 6 th edition, TATA Mcgraw-Hill
2. Software Project Management, WalkerRoyce 2nd edition, Pearson Education.

Reference Books:

1. Software Project Management in practice, PankajJalote, 9th edition, Pearson Education.
2. Software Project Management, Joel Henry, 3rd edition, Pearson Education.

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE18
Name of the Course	Scripting Languages (Professional Elective-V)					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Develop dynamic webpages and validate with java Script. **(K3)**
CO2: Discuss fundamentals of PHP. **(K2)**
CO3: Develop web applications using PHP. **(K3)**
CO4: Demonstrate Perl Programming concepts. **(K3)**
CO5: Illustrate AngularJS frame work. **(K2)**

UNIT – I: JavaScript: Overview of JavaScript, General Syntactic Characteristics, Primitives Operations and Expressions, Screen output and Keyboard Input, Control Statements, Object creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions, Events and Event Handling. **DHTML:** Positioning Moving and Changing Elements.

UNIT – II: PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT - III: Advanced PHP Programming: PHP and Web Forms, Files, PHP Authentication and Methodologies - Database Based, Login Administration, Uploading Files with PHP, Sending Email using PHP.

UNIT – IV: Introduction to PERL and Scripting: Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT- V: AngularJS - Overview, environment Setup, MVC Architecture, Creating AngularJS Application, Directives, Expressions, Controllers, Filters, Tables, HTML DOM, Modules, Forms.

Text Books:

1. The World of Scripting Languages, David Barron, Wiley Publications.
2. A Journey to Angular Development, by Sukesh Marla, bpb publisher

Reference Books:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E.Quigley, Pearson Education.
3. Programming Perl, Larry Wall T.Christiansen and J.Orwant, O'Reilly, SPD.
4. Tcl and the Tk Toolkit, Ousterhout, Pearson Education.
5. Pearl Power, J.P. Flynt, Cengage Learning.
6. Learn Angular in 24 Hours A Step-by-Step Approach, Lakshmi Kamala Thota.

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE19
Name of the Course	**Natural Language Processing (Professional Elective-V)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Illustrate Natural Language Processing tasks in syntax, semantics, and pragmatics. **(K2)**
CO2: Classify Morphology and Finite State Transducers, Markov Models and Entropy Models. **(K2)**
CO3: Explain about Statistical parsing and probabilistic CFGs. **(K2)**
CO4: Demonstrate semantic analysis. **(K2)**
CO5: Explain Discourse Analysis and Lexical Resources. **(K2)**

UNIT-I : Introduction: Natural Language Processing tasks in syntax, semantics, and pragmatics–Issues–Applications- The role of machine learning - Probability Basics–Information theory–Collocations-N-gram Language Models - Estimating parameters and smoothing – Evaluating language models.

UNIT-II : Morphology And Part Of Speech Tagging: Linguistic essentials - Lexical syntax- Morphology and Finite State Transducers - Part of speech Tagging - Rule-Based Part of Speech Tagging - Markov Models - Hidden Markov Models – Transformation based Models - Maximum Entropy Models. Conditional Random Fields.

UNIT-III : Syntax Parsing: Syntax Parsing - Grammar formalisms and treebanks - Parsing with Context Free Grammars ,Features and Unification-Statistical parsing and probabilistic CFGs(PCFGs)-Lexicalized PCFGs.

UNIT-IV : Semantic Analysis: Representing Meaning – Semantic Analysis - Lexical semantics –Word-sense disambiguation- Supervised – Dictionary based and Unsupervised Approaches - Compositional semantics- Semantic Role Labeling and Semantic Parsing – Discourse Analysis.

UNIT-V : Discourse Analysis and Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brills Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC). NLP Applications**:** Named entity recognition and relation extraction- IE using sequence labeling-Machine Translation (MT) .

Text Books:

1. Daniel Jurafsky and James H. Martin Speech and Language Processing (2nd Edition), Prentice Hall; 2 edition,2008
2. Foundations of Statistical Natural Language Processing by Christopher D.Manning and Hinrich Schuetze, MIT Press,1999
3. Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O'Reilly Media; 1 edition,2009 Roland R. Hausser, Foundations of Computational Linguistics: Human-Computer Communication in Natural Language, Paperback, MIT Press,2011

Reference Books:

1. Pierre M. Nugues, An Introduction to Language Processing with Perl and Prolog: An Outline of Theories, Implementation, and Application with Special Consideration of English, French, and German (Cognitive Technologies) Softcover reprint,2010
2. James Allen, Natural Language Understanding, Addison Wesley; 2 edition 1994
3. NLTK – Natural Language Tool Kit -http://www.nltk.org/

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTPE20
Name of the Course	**Social Networks and Semantic Web (Professional Elective-V)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Demonstrate knowledge by explaining the three different "named" generations of the web. **(K3)**
CO2: Construct a social network. **(K3)**
CO3: Relate knowledge representation methods for semantic web. **(K3)**
CO4: Describe web services and its Applications. **(K2)**
CO5: Develop "Linked Data" Applications using Semantic Web Technologies. **(K3)**

UNIT-I: The Semantic web: Limitations of the current Web, The semantic solution, Development of the Semantic Web, The emergence of the social web.

UNIT-II: Social Network Analysis: What is network analysis? Development of Social Network Analysis, Key concepts and measures in network analysis. Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks.

UNIT-III: Knowledge Representation on the Semantic Web: Ontologies and their role in the Semantic Web, Ontology languages for the semantic Web.
Modeling and Aggregating Social Network Data: State of the art in network data representation, Ontological representation of Social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data.

UNIT-IV: Developing social semantic applications: Building Semantic Web applications with social network features, Flink- the social networks of the Semantic Web community, Open academia: distributed, semantic-based publication management.

UNIT-V: Evaluation of Web-Based Social Network Extraction: Differences between survey methods and electronic data extraction, context of the empirical study, Data collection, Preparing the data, optimizing goodness of fit, Comparison across methods and networks, Predicting the goodness of fit, Evaluation through analysis.

Text Books:

1. Social Networks and the Semantic Web, PeterMika, Springer,2007.
2. Semantic Web Technologies, Trends and Research in Ontology basedsystems, J.Davies,RudiStuder,PaulWarren,JohnWiley&Sons.

Reference Books:

1. Semantic Web and Semantic Web Services –Liyang Lu Chapman and Hall/CRC Publishers, (Taylor & Francis Group).
2. Information Sharing on the semantic Web – Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.

Semester	VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20MBT52
Name of the Course	**Management Science**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand various approaches to Management. **(K2)**

CO2: To get familiarity with operations management in an organization. **(K2)**

CO3: Understand the Functions of Human Resource Management, Marketing Management and Financial Management. **(K2)**

CO4: To Sketch the networks for better project management. **(K3)**

CO5: Understand the Concept of Strategic Management and to get familiarity with contemporary developments in business management. **(K2)**

UNIT I: Introduction to Management Theory: Concept – Nature and importance of Management – Functions of Management – Managerial Skills - Scientific Management: F W Taylor contributions, Henry Fayol's 14 Principles. Theories of Motivation: Abraham Maslow's Need Hierarchy, Herzberg Two Factor Theory and Theory-X and Theory Y. Leadership styles – Decision making process.

UNIT – II: Operations Management: Plant Location, Plant layout types, Work study - Quality Management: SQC, Control Charts (X-Chart, R-Chart) simple problems, TQM, Six Sigma. Material Management: Need for Inventory control- EOQ, ABC analysis (HML, SDE, VED, and FSN analysis).

UNIT – III: Functional Management: Human Resource Management: Concept of HRM, Functions of HR Manager- Job analysis, Job Evaluation and Merit Rating. Marketing Management: Functions of Marketing Management - Four P's - New product development - Product Life Cycle - Services Marketing – Customer Relationship Management. Financial Management: Concept of Finance - Functions of Financial Management.

UNIT – IV: Project Management: (PERT/CPM): Development of Network–Difference between PERT and CPM- Identifying Critical Path – Project Crashing (Simple Problems).

UNIT - V: Strategic Management & Contemporary practices: Strategic Management: Vision, Mission, Goals, Strategy- Strategic management process – Elements of Corporate Planning Process – Environmental Scanning – SWOT analysis. **Contemporary Management Practices:** Remote working dynamics – Workforce diversity - Automation of business operations – ERP – Digital marketing – Green Marketing - Customization trends - AI in Business - Lean startups and entrepreneurship – Freelancing.

References:

1. Dr.A.R.Aryasri,ManagementScience'TMH2011.
2. Koontz&Weihrich:'Essentialsofmanagement'TMH2011
3. Seth&Rastogi:GlobalManagementSystems,Cengagelearning,Delhi,2011
4. Robbins:OrganizationalBehaviour,Pearsonpublications,2011
5. KanishkaBedi:Production&OperationsManagement,OxfordPublications,2011
6. PhilipKotler&Armstrong:PrinciplesofMarketing,Pearsonpublications
7. BiswajitPatnaik:HumanResourceManagement,PHI,2011
8. Hittand Vijaya Kumar: Starategic Management, Cengage learning
9. Prem Chadha: Performance Management, Trinity Press (An imprint of Laxmi Publications Pvt. Ltd.) Delhi 2015.
10. Anil Bhat &Arya Kumar: Principles of Management, Oxford University Press, New Delhi, 2015.

Semester	V - VII	L	T	P	C	COURSE CODE
Regulation	V20	0	0	6	3	V20CSTJE01
Name of the Course	**Master Coding and Competitive Programming - Part-1 (Job Oriented Elective)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Apply Mathematical reasoning and number theory to solve real world problems in linear time. **(K3)**

CO2: Use of modular arithmetic, to solve complex problems in linear time , logarithmic. **(K3)**

CO3: Use of Prime Factorization and complex solve problems. **(K3)**

CO4: Analyse different techniques including sieve to find prime numbers and evaluate efficiency of these methods. **(K4)**

CO5: Experiment with Hashing and searching techniques to solve problems on Arrays in Linear time. **(K3)**

LIST OF EXPERIMENTS

1. Develop Programs to solve problems based on Mathematical logic, Reasoning and number theory
2. Develop programs using different techniques to find prime number
3. Develop programs using Sieve method and optimize Complexity of finding prime number
4. Develop Programs based on series, patterns
5. Develop programs on concept of Fibonacci series
6. Develop programs on strings including palindrome and anagram concepts
7. Develop programs to search pattern in a string
8. Develop programs for String Processing.

Text Books:

1. Java The Complete Reference - Eleventh Edition, Herbert Schildt, Oracle
2. Guide to Competitive Programming by Antti Laaksonen
3. Programming challenges by Steven S Skiena

Tools:

1. practice.geeksfoegeeks.com
2. leetcode.com
3. codingninjas.com
4. Hackerrank.com
5. Interviewbit.com

Semester	V - VII	L	T	P	C	COURSE CODE
Regulation	V20	0	0	6	3	V20CSTJE02
Name of the Course	**Master Coding and Competitive Programming - Part-2 (Job Oriented Elective)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Apply Divide and Conquer algorithm technique to solve complex in logarithmic time. **(K3)**

CO2: Apply Greedy method to solve Optimization and decision making problems. **(K3)**

CO3: Apply Backtracking Algorithm technique to find combinatorial problems. **(K4)**

CO4: Experiment with Dynamic Programming Algorithm technique to solve Problems that uses Optimal substructures. **(K3)**

CO5: Develop programs using Linked List Graphs, DFS and BFS techniques. **(K3)**

LIST OF EXPERIMENTS

1. Develop Programs to solve problems based on Divide and Conquer Algorithm Technique.
2. Develop programs using two pointer and sliding window algorithms.
3. Problem Solving using Greedy Algorithm technique.
4. Problem Solving using Backtracking.
5. Develop programs using Dynamic Programming and Kadane Algorithm.
6. Develop programs using Linked List and its applications.
7. Develop programs using Graphs and Graph Searching Techniques.

Text Books:

1. Introduction to Algorithms, Second Edition, Thomas H. Cormen Charles E. Leiserson.
2. Data Structures and Algorithms Made Easy: Narasimha Karumanchi .
3. The Algorithm Design Manual, Springer series, Steven Skiena.

Tools:

1. practice.geeksfoegeeks.com
2. leetcode.com
3. codingninjas.com
4. Hackerrank.com
5. Interviewbit.com

Semester	V - VII	L	T	P	C	COURSE CODE
Regulation	V20	0	0	6	3	V20CSTJE03
Name of the Course	Full Stack Technologies (Job Oriented Elective)					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Demonstrate IDE tools Installation. **(K3)**
CO2: Develop programs using servlets. **(K3)**
CO3: Illustrate MVC architecture. **(K3)**
CO4: Demonstrate applications of Hibernate. **(K3)**
CO5: Illustrate Spring MVC Framework. **(K3)**

Exercise 1: Basic Installation of IDEs and Development Tools (use any one of the following IDEs): The Student should know about installing IDEs (Integrated Development Environment) in the system such as IntelliJ, Eclipse, NetBeans, Macromedia Dream Viewer and Databases such as My-SQL, Oracle, SQL Server etc.

Additional Tasks:

- How we can import project files into IDEs.
- How we can import eclipse (Java IDE) projects.
- How to Create new project in IDEs.
- How to Save the Project using packages.
- How to Compile the Project or Program in IDE.
- How to Build the Project or Program in IDE.
- How to Debug the Errors in IDE.

Exercise 2: Understanding about Servlets: Create Example programs Using the below concepts

- Introduction to Servlets.
- Write Servlet application to print current date & time.
- Write Servlet program to link Html & Servlet Communication.
- Write Servlet program to Auto refresh a page.
- Demonstrate session tracking using small program.
- Write Servlet program to insert/delete/update the record into database.
- Write Servlet program to add cookie to selected value.

Exercise 3: Understanding about Model View Controller: Create Example programs Using the below concepts

- Introduction to MVC in java.
- Create sample program on Model Layer in MVC Using Java.
- Create sample program on View Layer in MVC Using Java.
- Create sample program on Controller Layer in MVC Using Java.
- Demonstrate MVC Deployment in java.
- Rules for MVC Mapping in Server Side.
- How to use Web Server for MVC Deployment.

Exercise 4: Understanding about Spring MVC Framework: Create Example programs Using the below concepts

- Introduction to Spring MVC.
- Demonstrate the usage of Dispatcher Servlet in Spring MVC.
- Load the spring jar files or add dependencies in the case of Maven.
- Create the controller class.
- Provide the entry of controller in the web.xml file.
- Define the bean in the separate XML file.
- Display the message in the JSP page.
- Start the server and deploy the project.
- Execute the application on webserver using Spring MVC.

Exercise 5: Understanding about Hibernate: Create Example programs Using the below concepts

- Introduction to Hibernate.
- What is ORM
- Demonstrate the components of Hibernate
- How to persist objects using Hibernate
- How to use map using XML and Annotations
- How to implement Inheritance in Hibernate
- Working with relationship between entities - association
- Transactions in Hibernate
- Querying with HQL (Hibernate Query Language)
- Various other forms of querying - Criteria, QBE etc.

Exercise 6: Understanding Some Debugging Tools in Java : The Student should know about how to debug the java codes using some debugging tools such as:

- NetBeans.
- Eclipse.
- IntelliJ IDEA.
- Visual Studio Code.

Reference Books:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2. Murach's Java Servlets and JSP, 3rd Edition by (Murach: Training & Reference) 3rd Edition.
3. Spring and Hibernate Paperback – 1 July 2017 by K. Santosh Kumar.
4. Full Stack Java Development with Spring MVC, Hibernate, jQuery, and Bootstrap by Mayur Ramgir,Wiley.

Semester	V - VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTJE04
Name of the Course	**DevOps (Job Oriented Elective)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss the traditional software development. **(K2)**

CO2: Discuss the concepts of rise of agile methodologies. **(K2)**

CO3: Discuss the concept of DevOps and Agile. **(K2**)

CO4: Demonstrate the purpose of DevOps. **(K3)**

CO5: Illustrate the Operations of CAMS. **(K2)**

UNIT-I: Traditional Software Development: The Advent of Software Engineering - Waterfall method - Developers vs IT Operations conflict.

UNIT-II: Rise of Agile Methodologies: Agile movement in 2000 - Agile Vs Waterfall Method - Iterative Agile Software Development - Individual and team interactions over processes and tools – Working software over - comprehensive documentation - Customer collaboration over contract negotiation - Responding to change over following a plan.

UNIT-III: Definition of DevOps: Introduction to DevOps - DevOps and Agile.

UNIT-IV: Purpose of DevOps: Minimum Viable Product - Application Deployment - Continuous Integration - Continuous Delivery.

UNIT-V: **CAMS (Culture, Automation, Measurement And Sharing)**: CAMS – Culture - CAMS – Automation - CAMS – Measurement - CAMS – Sharing - Test-Driven Development - Configuration Management - Infrastructure Automation - Root Cause Analysis – Blamelessness - Organizational Learning.

Text Books:

1. The DevOps Handbook - Book by Gene Kim, Jez Humble, Patrick Debois, and Willis Willis.

Reference Books:

1. What is DevOps? - by Mike Loukides.

Semester	V - VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CSTJE05
Name of the Course	**Blockchain Technologies (Job Oriented Elective)**					
Branch	Common to CSE & CST					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss the Cryptographic primitives used in Blockchain. **(K2)**
CO2: Discuss about various technologies borrowed in Blockchain. **(K2)**
CO3: Illustrate various models for Blockchain. **(K2)**
CO4: Discuss about Ethereum. **(K2)**
CO5: Discuss about Hyperledger Fabric. **(K2)**

UNIT-I: Introduction: History of Bitcoin and origins of Blockchain, Fundamentals of Blockchain and key components, Permission and Permission-less platforms, Cryptography, SHA256 and ECDSA, Hashing and Encryption, Symmetric/ Asymmetric keys, Private and Public Keys.

UNIT-II: Technologies Borrowed in Blockchain: Technologies Borrowed in Blockchain–hash pointers--Digital cashetc.-Bitcoin Blockchain-Wallet–Blocks Merkley Tree - hardness of mining - Transaction verifiability - Anonymity -forks - Double spending - Mathematical analysis of properties of Bitcoin -Bitcoin-the challenges and solutions.

UNIT-III: Consensus Mechanisms: Consensus Algorithms: Proof of Work(PoW) as random oracle-Formal treatment of consistency-Liveness and Fairness-Proof of Stake(PoS)based Chains -Hybrid models (PoW + PoS), Byzantine Models of fault tolerance.

UNIT-IV: Ethereum: Ethereum- Ethereum Virtual Machine(EVM)-Wallets for Ethereum-Solidity-Smart Contracts-The Turing Completeness of Smart Contract Languages and verification challenges- Using smart contracts to enforce legal contracts-Comparing Bitcoin scripting vs. Ethereum Smart Contracts-Some attacks onsmart contracts.

UNIT-V: Hyperledger Fabric: Hyperledger fabric- the plug and play platform and mechanisms inpermissioned block chain - Beyond Cryptocurrency – applications of blockchain in cyber security- integrity of information-E-Governance and other contract enforcement mechanisms-Limitations of blockchain as a technology and myths vs reality of Blockchain technology.

Textbooks:

1. S.Shukla,M.Dhawan,S.Sharma,S.Venkatesan"BlockchainTechnology:CryptocurrencyandApplications",OxfordUniversityPress2019.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoinandcryptocurrencytechnologies:acomprehensiveintroduction",PrincetonUniversityPress, 2016.

Reference Books:

1. Joseph Bonneau et al, SoK: "Research perspectives and challenges for Bitcoin and cryptocurrency", IEEESymposiumonsecurityandPrivacy,2015
2. J.A.Garayetal,"Thebitcoinbackboneprotocol-analysisandapplications",EUROCRYPT2015,Volume2.
3. R.Passetal,"AnalysisofBlockchainprotocolinAsynchronousnetworks",EUROCRYPT2017.
4. Passetal,"Fruitchain-afairblockchain",PODC2017.

Semester	V - VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE01
Name of the Course	**Repair and Rehabilitation of Structures (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Develop various maintenance and repair strategies. **(K2)**

CO2: Evaluate the existing buildings through field investigations. **(K2)**

CO3: Understand and use the different techniques for structural rehabilitation and various techniques of repair. **(K2)**

CO4: Understand the importance of advanced concretes mixes. **(K2)**

CO5: Understand the importance of high performance concretes. **(K2)**

UNIT I: Deterioration of Structures and diagnosis: Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage, Non Destructive Testing, Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Inspection and Testing – Symptoms and Diagnosis of Distress – Damage assessment –

UNIT II: Materials for repair and rehabilitation: Admixtures- types of admixtures - purposes of using admixtures- chemical composition- Natural admixtures - Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates

UNIT III: Strengthening and stabilization: Techniques- design considerations-Beam shear capacity strengthening - Shear Transfer strengthening-stress reduction techniques- Column strengthening-flexural strengthening - Connection stabilization and strengthening, Crack stabilization

UNIT IV: Special Concretes: Fibre reinforced concrete: Properties of constituent materials- Mechanical properties of fiber reinforced concrete- applications of fibre reinforced concretes-Light weight concrete- properties of light weight concrete- No fines concrete- design of light weight concrete- Flyash concrete - classification of flyash- Properties of flyash concrete

UNIT V: High performance concretes: Introduction- Development of high performance concretes- Materials of high performance concretes- Properties of high performance concretes- Self Consolidating concrete- properties- qualifications.

Text Books:

1. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
2. Concrete Technology by A.R. Santa Kumar, Oxford University press
3. Concrete technology by Neville and J J Brooks, Pearson publications, 2nd edition

References:

1. Concrete technology by M S Shetty, S. Chand publications (2006).
2. Defects and Deterioration in Buildings, EF & N Spon, London
3. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press
4. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W.H.Ranso, (1981)
5. Building Failures: Diagnosis and Avoidance, EF & N Spon, London, B.A. Richardson, (1991)

Semester	V - VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE02
Name of the Course	**Ground Improvement Techniques (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Employ the in-situ densification methods at ground surface and at depth. **(K3)**
CO2: Relate the importance of dewatering and different methods of stabilization. **(K3)**
CO3: Illustrate the reinforced earth technology and soil nailing to obviate the problems posed by conventional retaining walls. **(K3)**
CO4: Use the geosynthetics to improve the engineering performance of soils. **(K3)**
CO5: Select different techniques of grouting to solve the ground problems. **(K3)**

UNIT I: In situ densification methods: In situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT II: Dewatering: Sumps and interceptor ditches – single and multi stage well points – vacuum well points – horizontal wells– electro osmosis
Stabilization of soils: Methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT III: Reinforced earth: Principles – components of reinforced earth –stability checks – soil nailing

UNIT IV: Geosynthetics: Geotextiles – types – functions, properties and applications – geogrids , geomembranes and gabions – properties and applications.

UNIT V: Grouting: Objectives of grouting – grouts and their applications – methods of grouting – stage of grouting.

Text Books:

1. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi.
2. Ground Improvement Techniques, Nihar Ranjan Patro, Vikas Publishing House (p) limited , New Delhi.
3. An introduction to Soil Reinforcement and Geosynthetics, G. L. Siva Kumar Babu, Universities Press.

References:

1. Ground Improvement, M.P.Moseley, Blackie Academic and Professional, USA
2. Designing with Geosynethetics, R. M Koerner, Prentice Hall
3. Engineering Principles of Ground Modification by Manfred R. Hausmann,McGraw-Hill Inc.,

Semester	V - VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE03
Name of the Course	**Environmental Pollution and Control (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe the air pollution and its control methods. **(K2)**
CO2: Explain industrial waste water and ways to control it. **(K3)**
CO3: Generalize the solid, hazardous waste and control methods. **(K2)**
CO4: Illustrate the importance of Environmental sanitation methods. **(K2)**
CO5: Illustrate the importance of Sustainable development. **(K3)**

UNIT I: Air Pollution: Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards. Noise Pollution: Noise standards, Measurement and control methods.

UNIT II: Industrial wastewater Management: Strategies for pollution control – Volume and Strength reduction-Recirculation of industrial waste water – Effluent standards.

UNIT III: Solid Waste Management: Solid waste characteristics –on-site handling and collection – separation and processing -Solid waste disposal method
Hazardous Waste: Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal methods.

UNIT IV: Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT V: Sustainable Development: Definition- elements of sustainable developments-Indicators of sustainable development- Sustainability Strategies- sustainable development.

Text Books:

1. Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elesevier, 2003.
2. Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
3. Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing.

References:

1. Solid Waste Engineering, Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004
2. Hazardous Waste Management, Charles A. Wentz, McGraw Hill Publication, 1995.

Semester	V - VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE04
Name of the Course	**Building Materials and Construction (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe different building materials and their importance in building construction. **(K2)**

CO2: Relate various components of cement and lime. **(K3)**

CO3: Generalize the brick and stone masonry in construction. **(K2)**

CO4: Interpret different aggregates and their specifications. **(K2)**

CO5: Describe the importance of different building components. **(K2)**

UNIT I: Stones, Bricks and Tiles: Building stones – classifications and quarrying – properties –structural requirements and dressing. Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics, Timber, Aluminum, Glass, Paints and Plastics: Wood - structure – types and properties– seasoning – defects; alternate materials for Timber–GI/ fibre – reinforced glass bricks, steel & aluminum, Plastics.

UNIT II: Cement & Admixtures: Ingredients of cement – manufacture – Chemical composition – Hydration - field & lab tests, Admixtures – mineral & chemical admixtures – uses, Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime

UNIT III: Mortars: Lime and Cement Mortars.
Masonry: Brick masonry – types – bonds; Stone masonry – types; Composite masonry – Brick- stone composite; Concrete, Reinforced brick. Cavity and partition walls, Finishing's, Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.

UNIT IV: Aggregates: Classification of aggregate – Coarse and fine aggregates- particle shape and texture – Bond and Strength of aggregate – Specific gravity – Bulk Density, porosity and absorption – Moisture content of Aggregate- Bulking of sand – Sieve analysis.
Miscellaneous materials: Bitumen and asphaltic materials, structural steel and other metals, geo textiles, carbon composites including properties and uses.

UNIT V: Building Components: Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs – flat, curved, trussed. Foundations – types; Damp Proof Course; Joinery – doors – windows – materials – types.
Form work: Types: Requirements – Standards – Scaffolding.

Text Books:

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications. 2010,5th edition.
2. Building Materials, M. L. Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi. 2014,5th edition,.
3. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd., New Delhi. 2016,11th edition.
4. Building Materials, S. S. Bhavikatti, Vikas publications House private ltd. 2012, 1st edition.
5. Building Construction, S. S. Bhavikatti, Vikas publications House private ltd. 2012, 1st edition.
6. Building planning and drawing,Dr.N.Kumara swamy,A.kameswara Rao, 2012, 6th edition.

References:

1. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2017,1st edition.
2. Building Materials by Duggal, New Age International. 2012 ,4th edition.
3. Building Materials by P. C. Varghese, PHI. 2015, 2nd edition.
4. Building Construction by PC Varghese PHI. 2007, 1st edition.
5. Construction Technology – Vol – I & II by R. Chubby, Longman UK.1987, 2nd edition.
6. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.2017 ,2nd edition

Semester	V - VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE05
Name of the Course	**Remote Sensing and GIS (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Generalize the basic principles of Remote Sensing and GIS, including ground, air and satellitebased sensor platforms. **(K2)**

CO2: Interpret the aerial photographs and satellite imageries. **(K2)**

CO3: Relate the process of data entry and preparation. **(K3)**

CO4: Examine the Spatial Data for a variety of applications. **(K3)**

CO5: Employ RS and GIS for diverse applications. **(K3)**

UNIT I: Introduction to Remote Sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, Characteristics of remote sensing systems.

Sensors and platforms: Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT, MODIS, ASTER,RISAT and CARTOSAT.

UNIT II: Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

UNIT III: Geographic Information System: Introduction, key components, application areas of GIS, map projections.

Data entry and preparation: spatial data input, raster data models, vector data models.

UNIT IV: Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing and buffer analysis.

UNIT V: RS and GIS Applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications.

Applications of Hydrology, Water Resources and Disaster Management: Food zoning and mapping, groundwater prospects and potential recharge zones, watershed management and disaster management with case studies.

Text Books:

1. "Remote sensing and GIS", Bhatta, B., Oxford University Press, 2008.
2. "Remote Sensing and Geographical Information Systems", Anji Reddy, M., B S Publications, 2008.
3. "Basics of Remote Sensing and GIS" Kumar. S., Laxmi Publications

References:

1. "Fundamentals of Remote Sensing", George Joseph, Universities Press, 2013.
2. "Concepts and Techniques of Geographical Information System", Chor Pang Lo and Yeung, A.K.W., Prentice Hall, India, 2006.
3. "Remote Sensing and its Applications", Narayan L.R.A, Universities Press, 2012.
4. "Introduction to Geographic Information Systems", Kand Tsung Chang, McGraw Hill Higher Education, 2009.
5. "Basics of Remote sensing & GIS", Kumar, S., Laxmi Publications, New Delhi, 2005.
6. "Principals of Geographical Information Systems", Burrough, P.A and McDonnell, R.A. Oxford University Press, 1998.
7. "Remote Sensing", Schowenger, R. A., Elsevier publishers, 2006.
8. "Remote Sensing and Image Interpretation", Lillesand, T.M, Kiefer, R.W. and Chipman, J.W., Wiley India Pvt. Ltd., New Delhi, 2013.
9. "Fundamentals of Geographic Information Systems", Demers, M.N, Wiley India Pvt.Ltd, 2013

Semester	V-VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE06
Name of the Course	**Solid Waste Management (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Generalize Solid Waste and its management. **(K2)**
CO2: Assess different elements for managing Solid Waste. **(K3)**
CO3: Employ different methods for transportation and transformation of solid waste. **(K3)**
CO4: Organize different methods for processing and treatment of municipal solid waste. **(K3)**
CO5: Practice suitable disposal methods with respect to solid waste. **(K3)**

UNIT I: Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste – Factors Influencing generation of solid waste – sampling and characterization – Future changes in waste composition, major legislation, monitoring responsibilities.

UNIT II: Basic Elements In Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste Collection of Solid Waste: Types and methods of waste collection systems, analysis of collection system – optimization of collection routes.

UNIT III: Transportation and Transformation of Solid Waste: Need for transfer operation, compaction of solid waste – transport means and methods, transfer station types and design requirements.
Unit operations used for separation and transformation: shredding – materials separation and recovery, source reduction and waste minimization.

UNIT IV: Processing and Treatment: Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

UNIT V: Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

Text Books:

1. "Integrated Solid Waste Management", George Techobanoglous, McGraw Hill Publication, 1993
2. "Environmental Engineering", Gerard Kiely, McGraw Hill Publication, 2007
3. "Environmental Science and Engineering", J Glynn Henry,. Gary W.Heinke, Prentice-Hall of India Pvt Ltd, 1996

References:

1. "Solid Waste Engineering", Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, New Delhi, 2004
2. "Hazardous Waste Management", Charles A. Wentz., McGraw Hill Publication, 1995.
3. "Introduction to Environmental Engineering" Mackenzie L Davis, David A.Cornwell, McGraw Hill Publication, 2017

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE07
Name of the Course	**Disaster Management (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe different natural hazards and disaster management. **(K2)**
CO2: Generalize the risk and vulnerability of disaster. **(K2)**
CO3: Illustrate the role of technology in disaster management. **(K3)**
CO4: Relate the importance of education and community preparedness to disaster recovery. **(K3)**
CO5: Organize the multi-sectional issues created by disaster. **(K2)**

UNIT I: Natural Hazards and Disaster Management: Introduction of DM Disaster Management cycle – Five priorities for action- Case study methods of the following: floods, droughts – Earthquakes – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast – landslides. Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrotirism - rail and air craft's accidents-Management of these disasters

UNIT II: Risk and Vulnerability: – Building codes and land use planning – social vulnerability – environmental vulnerability -Financial management of disaster.

UNIT III: Role of Technology in Disaster Managements: Disaster management for infra structures, taxonomy of infra structure - mitigation programme for earth quakes –geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training- transformable indigenous knowledge in disaster reduction.

UNIT IV: Education and Community Preparedness: Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building.

UNIT V: Multi-sectional Issues: Impact of disaster on poverty and deprivation- Climate change adaptation and human health -Exposure , health hazards and environmental risk-Forest management and disaster risk reduction - The Red cross and red crescent movement.

Text Books:

1. Disaster Management – Global Challenges and Local Solutions' by Rajib shah & R R Krishnamurthy(2009), Universities press.
2. Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
3. Disaster Management – Future Challenges and Opportunities' by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

Reference Books:

1. 'Disaster Management' edited by H K Gupta (2003), Universities press.
2. Natural Hazards and Disaster Management, Vulnerability and Mitigation by RB Singh
3. Disaster Management by Harish K.Gupta

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20CEOE08
Name of the Course	**Water Quality and Conservation Systems (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe different parameters of Engineering Hydrology. **(K2)**
CO2: Relate different sources of surface and ground water. **(K3)**
CO3: Assess the importance of water supply systems and quality of water in reference to IS and WHO standards. **(K3)**
CO4: Develop different systems of plumbing. **(K3)**
CO5: Employ different conservation techniques. **(K3)**

UNIT I: Introduction to Hydrology: Engineering hydrology, applications, Hydrologic cycle, evaporation, evapotranspiration, precipitation, run off, infiltration, hydrological data-sources

UNIT II: Sources of Water: Surface water, Lakes, Rivers, Reservoirs, comparison of sources with reference to quality, quantity and other considerations.
Groundwater, types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries.

UNIT III: Importance of Protected Water: Supply systems, Flow chart of public water supply system, Water borne diseases, Estimation of water usages in different purpose.
Quality and Analysis of Water: Characteristics of water–Physical, Chemical and Biological-Analysis of Water – Physical, Chemical and Biological characteristics, Comparison of sources with reference to quality- I.S. Drinking water quality standards and WHO guidelines for drinking water.

UNIT IV: Plumbing Systems: Systems of plumbing-types of pipes and sanitary fittings and other accessories– one pipe and two pipe systems – Design parameters and factors.

UNIT V: Water conservation: importance and necessity, objectives, systems-rainwater harvesting, recharge pits, watershed.

Text Books:

1. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985
2. Elements of Environmental Engineering, K. N. Duggal, S. Chand & Company Ltd.New Delhi, 2012.
3. Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie

References:

1. Water Supply Engineering – P. N. Modi.
2. Water Supply Engineering – B. C. Punmia
3. Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20EEOE1
Name of the Course	Non-Conventional Energy Sources (Open Elective)					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the concepts of solar radiation data, extra terrestrial radiation, and radiation on earth's surface. **(K2)**

CO2: Understand the operation of various solar thermal Systems. **(K2)**

CO3: Choose suitable maximum power point tracking technique in solar PV and wind application. **(K3)**

CO4: Explain basic principle and working of hydro and tidal power systems. **(K2)**

CO5: Explain the basic principle of biomass, fuel cell andgeothermal systems. **(K2)**

UNIT–I: Fundamentals of Energy Systems

Energy conservation principle, Energy scenario (world and India), Solar radiation**:** Outsideearth's atmosphere, Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surface, Numerical problems.

UNIT–II: Solar Thermal Systems

Liquid flat plate collections**:** Performance analysis, Transmissivity, Absorptivity, Product collector efficiency factor, Collector heat removal factor, Numerical problems, Introduction to solar air heaters, Concentrating collectors and solar pond.

UNIT–III: Solar Photovoltaic Systems

Balance of systems, I-V & P-V characteristics, System design**,** Storage sizing, PV system sizing, Maximum power point techniques**,** Perturb and observe (P&O) technique, Incremental Conductance (INC), Hill climbing technique.

Wind Energy

Wind patterns, Types of turbines, Kinetic energy of wind, Betz coefficient, Tip–speed ratio, efficiency, Power output of wind turbine, Selection of generator (synchronous, induction), Maximum power point tracking.

UNIT–IV: Hydro and Tidal power systems

Basic working principle, Classification of hydro systems: large, small, micro, Measurement of head and flow, Energy equation, Types of turbines, Numerical problems.

Tidal power-Basics, Kinetic energy equation, Numerical problems, Wave power-basics, Kinetic energy equation.

UNIT–V: Biomass, fuel cells and geothermal systems

Biomass Energy**:** Fuel classification – Pyrolysis – Direct combustion of heat– Different digesters and sizing, Fuel cell**:** classification – Efficiency – V-I characteristics–Geothermal**:** classification – Dry rock and acquifer – Energy analysis.

Text Books:

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K.Nayak, TMH, New Delhi, 3rd Edition, 2013.
2. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis - secondedition, 2013.

Reference Books:

1. Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly,Oxford University Press, 2nd edition, 2013.
2. Renewable Energy- Edited by Godfrey Boyle-oxford university.press,3rd edition, 2013.
3. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, Worldscientific, Singapore, 2011.
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa.
5. Renewable energy technologies – A practical guide for beginners – Chetong SinghSolanki, PHI, 2008.
6. Non-conventional energy source –B.H.khan- TMH-2nd edition, 2017.

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20EEOE2
Name of the Course	**Basics of Control systems (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Construct the transfer function of various mechanical andelectrical systems using block diagram algebra and signal flow graphs. **(K2)**

CO2: Find the time response specifications of second ordersystems and absolute, relative stability of LTI systems using routh's stability criterion and the root locus method. **(K3)**

CO3: Assess the stability of LTI systems using frequency response methods. **(K3)**

CO4: Construct the lag, lead, lag-lead compensators from bode diagrams to improve the system performance. **(K2)**

CO5: Understand the concepts in state space representation ofLTI systems, controllability and observability. **(K2)**

UNIT – I: Mathematical modeling of control systems

Classification of control systems, open loop and closed loop control systems and their differences, Feedback characteristics, transfer function of linear system, differential equations of electrical networks, translational and rotational mechanical systems, transfer function of DC servo motor – AC servo motor – synchro, transmitter and receiver – block diagram algebra – representation by signal flow graph – reduction using Mason's gain formula.

UNIT-II: Time response analysis

Standard test signals – time response of first and second order systems – time domain specifications, steady state errors and error constants, effects of proportional (P), proportional- integral (PI),proportional-integral derivative(PID) systems.

Stability and root locus technique

The concept of stability – Routh's stability criterion – limitations of Routh's stability, root locus concept – construction of root loci (simple problems), Effect of addition of Poles and zeros to the transfer function.

UNIT–III: Frequency response analysis

Introduction to frequency domain specifications – Bode diagrams – transfer function from the Bode diagram – phase margin and gain margin – stability analysis from Bode plots, Polar plots, Nyquist stability criterion.

UNIT–IV: Classical control design techniques

Lag, lead, lag-lead compensators, design of compensators using Bode plots.

UNIT–V: State space analysis of LTI systems

Concepts of state, state variables and state model, state space representation of transfer function, diagonalization, solving the time invariant state equations, State Transition Matrix and it's Properties, concepts of controllability and observability.

Text Books:

1. Control Systems principles and design, M. Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition, 2014.
2. Automatic control systems, Benjamin C. Kuo, Prentice Hall of India,2nd Edition, 2014.

Reference Books:

1. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India, 2002.
2. Control Systems, ManikDhanesh N, Cengage Publications, 2012.
3. Control Systems Engineering, I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition, 2007.
4. Control Systems Engineering, S.Palani, Tata McGraw Hill Publications, 2009.5.
5. https://nptel.ac.in/courses/107/106/107106081/

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20EEOE3
Name of the Course	**Principles of Electric Power Conversion (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the basic operation of various power electronic devices and converters. **(K2)**
CO2: Apply the suitable power electronic converter for different electrical machines. **(K3)**
CO3: Understand the operation of various renewable energy sources. **(K2)**
CO4: Understand the operation of different energy storage systems and their applications. **(K2)**
CO5: Choose the suitable heating and welding method for different domestic and industrial applications. **(K3)**

UNIT-I: POWER ELECTRONIC DEVICES AND CONVERTERS

V-I Characteristics of SCR, MOSFET and IGBT. Phase controlled rectifiers, DC-DC converters and Inverters.

UNIT-II: APPLICATION OF CONVERTERS TO ELECTRICALMACHINES

Speed control of DC motor, Induction motors, PMSM and BLDC drives

UNIT-III: RENEWABLE ENERGY SOURCES AND THEIR INTEGRATION TO GRID

Introduction to solar cell, solar panels, MPPT, wind and other renewable energy sources, Integration of renewable energy sources to the grid.

UNIT-IV: ENERGY STORAGE SYSTEMS

Study of automotive batteries, SMF, pumped storage systems, super-capacitors; fly wheels – applications, Li-ion batteries and applications to electric vehicles.

UNIT-V: DOMESTIC AND INDUSTRIAL APPLICATIONS

Induction heating, welding, melting, hardening, lighting applications and their control, UPS, battery chargers.

Text Books:

1. M.H.Rashid: Power Electronics-circuits, Devices and applications, Prentice Hall India, NewDelhi,2009
2. P.S.Bhimbra: Power Electronics, Khanna publishers, New Delhi,2012
3. Ned Mohan, Undeland and Robbin: Power electronics converters, applications anddesign, JohnWilley & Sons, Inc. NewYork, 2006.
4. Utilization of Electrical Energy and Traction, J.B.Gupta, Rajeev Manglik, RohithManglik, KATSONBooks, 2012

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20EEOE4
Name of the Course	Programmable Logic Controller and Applications (Open Elective)					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the basic concepts of PLCs and their I/O modules. **(K2)**
CO2: Construct the control algorithms to PLC using ladder logic. **(K2)**
CO3: Illustrate the PLC registers for effective utilization in different applications. **(K2)**
CO4: Understand the function of various program control instructions. **(K2)**
CO5: Apply the suitable controller in real time applications. **(K3)**

Unit I: Introduction

PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming equipment,programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

Unit II: PLC Programming

PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Digital logic gates, programming in the Boolean algebra system, conversion examples. Ladder diagrams and sequence listings, ladder diagram construction.

Unit III: Programmable Timers and Counters

Timer instructions – On delay time instruction – Off delay timer instruction – Retentive timer – Counter instructions – Up counter – Down counter – Cascading counters – Incremental encoder
– Counter applications– Combining counter and timer functions.

Unit IV: Program Control Instructions

Master control reset instruction – Jump instructions and sub routines – Immediate input and output instructions.- Data manipulation – Data transfer operation – Data compare instruction – Data manipulation programs – Numerical data I/O interfaces – Math instructions – Addition, subtraction, multiplication & division instruction– Sequential instructions – Sequence programs – Shift registers – Word shiftregisters.

Unit V: Applications

Control of water level indicator – Alarm monitor - Conveyor motor control – Parking garage – Ladder diagram for process control – PID controller.

Text Books:

1. Programmable logic controllers by Frank D. Petruzella- McGraw Hill – 3rd Edition.
2. Programmable Logic Controllers – Principle and Applications by John W. Webb andRonald A. Reiss, Fifth Edition, PHI

Reference Books:

1. Programmable Logic Controllers – Programming Method and Applications by JR.Hackworth and F.D Hackworth Jr. – Pearson, 2004.
2. Introduction to Programmable Logic Controllers- Gary Dunning- Cengage Learning.Programmable Logic Controllers –W. Bolton-Elsevier publisher, 2005.

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20EEOE5
Name of the Course	**Energy Storage Systems (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Classify different energy storage systems. **(K2)**
CO2: Understand the operation of different energy storage systems. **(K2)**
CO3: Illustrate the role of electrical energy storage systems in various aspects. **(K2)**
CO4: Understand the operation of different Electrical Energy Storage (EES) systems. **(K2)**
CO5: Apply suitable EES system to various applications. **(K3)**

UNIT - I: Introduction:

Necessity of energy storage, different types of energy storage, mechanical, chemical, electrical, electrochemical, biological, magnetic, electromagnetic, thermal, comparison of energy storage technologies

UNIT - II: Energy Storage Systems:

Thermal Energy storage-sensible and latent heat, phase change materials, Energy and exergy analysis of thermal energy storage, Electrical Energy storage-super-capacitors, Magnetic Energy storage-Superconducting systems, Mechanical-Pumped hydro, flywheels and pressurized air energy storage, Chemical-Hydrogen production and storage, Principle of direct energy conversion using fuel cells, thermodynamics of fuel cells, Types of fuel cells, Fuel cell performance, Electrochemical Energy Storage- Battery, primary, secondary and flow batteries.

UNIT – III: Needs for Electrical Energy Storage:

Emerging needs for EES, More renewable energy-less fossil fuel, Smart Grid uses - the roles of electrical energy storage technologies-the roles from the viewpoint of a utility-the roles from the viewpoint of consumers-the roles from the viewpoint of generators of renewable energy.

UNIT - IV: Types of Electrical Energy Storage systems:

Electrical storage systems, Double-layer capacitors (DLC), Superconducting magnetic energy storage (SMES),super charging stations, Thermal storage systems, Standards for EES, Technical comparison of EES technologies.

UNIT - V: Applications of Electrical Energy Storage:

Renewable energy storage-Battery sizing and stand-alone applications, stationary (Power Grid application),Small scale application-Portable storage systems and medical devices, Mobile storage Applications- Electric vehicles (EVs), types of EVs, batteries and fuel cells, future technologies, hybrid systems for energy storage.

Text Books:

1. Energy Storage - Technologies and Applications by Ahmed Faheem Zobaa, InTech, 2013.
2. Fundamentals of Energy Storage by J. Jensen and B. Sorenson, Wiley-Interscience, New York, 984
3. Energy Storage: Fundamentals, Materials and Applications, by Huggins R. A., Springer, 2019.

Reference Books:

1. Thermal energy storage: Systems and Applications by Dincer I. and Rosen M. A., Wileypub, 2011.
2. Electric & Hybrid Vehicles by G. Pistoia, Elsevier, 2010.
3. Fuel cell Fundamentals by R. O'Hayre, S. Cha, W. Colella and F. B. Prinz, Wiley Pub, 2016.

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20EEOE6
Name of the Course	Soft Computing Techniques (Open Elective)					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the basic concepts of different soft computing techniques like fuzzy, GA and neural network. **(K2)**

CO2: Understand the fundamental concepts of artificial neural networks. **(K2)**

CO3: Explain the basic concepts & convergence of GA. **(K2)**

CO4: Explain the basic concepts of fuzzy systems and its applications. **(K2)**

CO5: Apply different evolutionary algorithms to various applications. **(K3)**

Unit I: Introduction to AI

Artificial Intelligence – a Brief Review – Pitfalls of Traditional AI – Need for ComputationalIntelligence –Importance of Tolerance of Imprecision and Uncertainty - Constituent Techniques – Overview of Artificial Neural Networks - Fuzzy Logic - Evolutionary Computation.

Unit II: Artificial Neural Networks

Supervised Learning: Introduction and how brain works, Neuron as a simple computing element, The perceptron, Back propagation networks: architecture, multilayer perceptron, back propagation learning-input layer, accelerated learning in multilayer perceptron, The Hopfield network, Bidirectional associative memories(BAM), RBF Neural Network.

Unsupervised Learning: Hebbian Learning, Generalized Hebbian learning algorithm, Competitive learning, Self- Organizing Computational Maps: Kohonen Network.

Unit III: Genetic algorithms

Genetic algorithms basic concepts, encoding, fitness function, reproduction-Roulette wheel, Boltzmann, tournament, rank, and steady state selections, Convergence of GA, Applications of GA-case studies.

Unit IV: Fuzzy Logic

Fuzzy Sets – Properties – Membership Functions - Fuzzy Operations. Fuzzy Logic and Fuzzy Inference System

Unit V: Evolutionary Computation

Evolutionary Computation - Overview of other Bio-inspired Algorithms - Swarm IntelligenceAlgorithms

Text Books:

1. R. Rajasekaran and G. A and Vijayalakshmi Pai, Neural Networks, Fuzzy Logic, andGenetic, 2013.
2. Algorithms: Synthesis and Applications, Prentice Hall of India,2008
3. D. E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning,Addison-Wesley
4. T. Ross, Fuzzy Logic with Engineering Applications, Tata McGraw Hill, 2003

Reference Books:

1. L. Fausett, Fundamentals of Neural Networks, Prentice Hall, 2004

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20EEOE7
Name of the Course	Electric Vehicles (Open Elective)					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the fundamentals of an electric vehicle. **(K2)**
CO2: Explain the technical characteristics and properties of batteries. **(K2)**
CO3: Estimate the ratings and requirements of electrical machines. **(K2)**
CO4: Illustrate the regenerative braking system of an electric vehicle. **(K3)**
CO5: Estimate the sizing of components of hybrid electric vehicles. **(K2)**

UNIT I: ELECTRIC VEHICLES

Introduction, Components, vehicle mechanics – Roadway fundamentals, vehicle kinetics, Dynamics of vehicle motion - Propulsion System Design.

UNIT II: BATTERY

Basics – Types, Parameters – Capacity, Discharge rate, State of charge, state of Discharge, Depthof Discharge, Technical characteristics, Battery pack Design, Properties of Batteries.

UNIT III: DC & AC ELECTRICAL MACHINES

Motor and Engine rating, Requirements, DC machines, Three phase A.C machines, Induction machines, permanent magnet machines, switched reluctance machines.

UNIT IV: ELECTRIC VEHICLE DRIVE TRAIN

Transmission configuration, Components – gears, differential, clutch, brakes regenerative braking, motor sizing.

UNIT V: HYBRID ELECTRIC VEHICLES

Types – series, parallel and series, parallel configuration – Design – Drive train, sizing ofcomponents.

Text Books:

1. Iqbal Hussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRCPress,2011.
2. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003.

Reference Books:

1. MehrdadEhsani, YiminGao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel CellVehicles : Fundamentals", CRC Press, 2010.
2. SandeepDhameja, "Electric Vehicle Battery Systems", Newnes, 2000
3. http://nptel.ac.in/courses/108103009/

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20EEOE8
Name of the Course	**Indian Electricity Act, 2003. (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the national policy, plan and the jointresponsibilities of state and central governments. **(K2)**

CO2: Illustrate the process of licensing and the provisions related to transmission and distribution of electricity. **(K2)**

CO3: Understand the regulatory commissions and CentralElectricity Authority (CEA). **(K2)**

CO4: Illustrate the Appellate Tribunal, Reorganization of boards, offences and penalty. **(K2)**

CO5: Understand the constitution procedures of special courts and dispute resolution. **(K2)**

UNIT - I: National electricity policy and plan, generation of electricity

Electricity Act: commencement, definitions, comments; national policy on standalone systems, non-conventional energy systems, electrification and local distribution for rural areas; joint responsibilities of state and central governments in rural electrification, requirement for setting up of generating station, hydro-electric generation, captive generation; duties of generating companies.

UNIT - II: Licensing, transmission and distribution of electricity

Licensing: powers, procedures, conditions, amendments, revocation, provisions, directions, suspension and sale; inter-state and intra-state transmission; other provisions relating to transmission; provisions with respect to distribution licenses, electricity traders, supply - consumer protection: standard performance.

UNIT - III: Tariff, works, CEA and Regulatory commissions

Works of licenses, provisions relating to overhead lines; Constitution and functions of Central Electricity Authority (CEA), directions and certain powers; Constitution, powers and functions of state and central commissions, other provisions, proceedings and powers of appropriate commission, Grants, Fund, Accounts Audit and Report.

UNIT - IV: Appellate Tribunal, Reorganization of boards, offences and penalty

Appellate Tribunal for electricity; investigation and assessment; reorganization of boards; Offences and penalties.

UNIT - V: Special courts, Dispute resolution, other provisions and Miscellaneous

Constitution of special courts, procedures, powers, appeal, revision; arbitration; protective clauses; miscellaneous and enactments.

Text Books:

1. The Electricity Act, 2003 {Act 36 of 2003, dt.2-6-2003, w.e.f. 10-6-2003 vide S.O. No.669(E), dt. 10-6-2003} published by Commercial Law Publishers (I) Pvt. Ltd

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20EEOE9
Name of the Course	**Power Systems for Data Centers (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the basics of power in the data centre. **(K2)**
CO2: Illustrate the uninterrupted power supply. **(K2)**
CO3: Illustrate the operation of generators and various power devices. **(K2)**
CO4: Estimate the power required in the data centre. **(K2)**
CO5: Describe the different methods to improve data centre energy efficiency. **(K2)**

UNIT -I: Fundamentals of Power

Power basics and key terms, Power calculations, Grounding Power problems, Power protection system equipment.

UNIT -II: Uninterruptible Power Supply (UPS)

UPS basics, UPS topologies, UPS redundancy and efficiency, Modular UPS, UPS batteriesFlywheel UPS.

UNIT –III: Generators and Other Power Devices

Generators, Automatic and static transfer switches, Power distribution units, Circuit Breakers, Circuit Breaker Coordination, Circuit Breaker Protection, Circuit Breaker Sizing.

UNIT –IV: Power Distribution in the Rack

Rack power redundancy, Server power calculations, Power cabling, calculating power requirements, Power consumption in the data centre, Reducing Wasted Power in the Data Centre: reducing server power

UNIT –V: Data Center Energy Efficiency and practices

Data centre power growth, Barriers to data centre energy efficiency, Power consumption in the data centre, Power Usage effectiveness (PUE), Measuring PUE, Other data centre efficiency metrics

Energy Efficiency Best Practices

Reducing the support infrastructure load, Systematic approach to improving energy efficiency.

Text Books:

1. Data Center Handbook, by Hwaiyu Geng, Publisher(s): Wiley ISBN: 9781118436639, 2014

Reference Books:

1. Designing Data Centers - Book 1: Power: Specifying the requirements, power generation, power distribution, power efficiency, and fault tolerance for data centers, by by B.A.Ayomaya, ISBN-13 : 979-8695727715
2. Guide to Data Centre Power Systems, Publication Year: 2021, Pages:278 ISBN-13: 978- 1-78561-828-4

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20EEOE10
Name of the Course	Concepts of Power System Engineering (Open Elective)					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the working of thermal and nuclear power generating stations. **(K2)**
CO2: Estimate the R,L and C parameters of transmission lines (Nominal T and π models). **(K2)**
CO3: Find the parameters of DC and AC distribution systems along with voltage drop. **(K3)**
CO4: Understand the operation of fuses and circuit breakers. **(K2)**
CO5: Illustrate the speed/time characteristics of different types of traction motors. **(K2)**

UNIT – I: Introduction to the Sources of Energy

Thermal Power Stations Selection of site, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system & operation of thermal plant

Nuclear Power Stations: Location of nuclear power plant, Working principle, Nuclear fission, Nuclear fuels, Nuclear chain reaction, nuclear reactor Components: Moderators, Control rods, Reflectors and Coolants.

UNIT – II: Parameters of Transmission line

Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, concept of GMR & GMD- Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance. Classification of Transmission Lines and their model representations -Nominal-T, Nominal-π, Ferranti effect - Numerical Problems.

UNIT – III: Distribution Systems

Classification of distribution systems, design features of distribution systems, radial distribution, ring main distribution, voltage drop calculations: DC distributors for following cases - radial DC distributor fed at one end and at both ends (equal / unequal voltages), ring main distributor.

UNIT-IV: Protective devices

Principle of operation of HRC fuses – SF6, oil circuit breakers, circuit reclosures and Linesectionalizes.

UNIT–V: Electric Traction

System of electric traction and track electrification– Review of existing electric traction systemsin India–Special features of traction motor–Mechanics of train movement–Speed–time curves for different services –Trapezoidal and quadrilateral speed time curves.

Text Books:

1. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers, 2015.
2. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakrabarti, Dhanpat Rai & Co. Pvt. Ltd., 2008
3. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman,1971.

Reference Books:

1. Electrical Power Systems by P.S.R. Murthy, B.S. Publications, 2017.
2. Art & Science of Utilization of electrical Energy – by Partab, DhanpatRai & Sons, 2017

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20EEOE11
Name of the Course	Fundamentals of Smart Grid Technologies (Open Elective)					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the basic structure of an electricity marketing conditions. **(K2)**
CO2: Illustrate the developing technologies in DC distribution and smart grid. **(K2)**
CO3: Understand the concepts of dynamic energy systems. **(K2)**
CO4: Illustrate the development of smart domestic system. **(K2)**
CO5: Illustrate the development of intelligent domestic system. **(K2)**

UNIT - I: Introduction to Smart Grid & evolving it to a Perfect Power System:

Introduction: Introduction to smart grid- Electricity network-Local energy networks- Electric transportation-Low carbon central generation-Attributes of the smart grid- Alternate views of a smart grid. Smart Grid to Evolve a Perfect Power System: Introduction- Overview of the perfect power system configurations- Device level power system- Building integrated power systems- Distributed power systems-Fully integrated power system-Nodes of innovation.

UNIT - II: DC Distribution and Smart Grid

AC vs DC sources-Benefits of DC power delivery systems-Powering equipment and appliances with DC-Data centers and information technology loads-Future neighborhood-Potential future work and research. Intelligrid Architecture for the Smart grid: Introduction- Launching intelligrid- Intelligrid today- Smart grid vision based on the intelligrid architecture-Barriers and enabling technologies. SCADA, synchro phasors (WAMS)

UNIT – III: Dynamic Energy Systems Concept

Smart energy efficient end use devices-Smart distributed energy resources-Advanced whole building control systems- Integrated communications architecture-Energy Management-Role oftechnology in demand response-Current limitations to dynamic energy management- Distributed energy resources-Overview of a dynamic energy management-Key characteristics of smart devices- Key characteristics of advanced whole building control systems-Key characteristics of dynamic energy management system.

UNIT - IV: Energy Port as a Part of the Smart Grid & Market Implementation

Energy Port as Part of The Smart Grid: Concept of energy -Port, generic features of the energy port. Policies and Programs to Encourage End – Use Energy Efficiency: Policies and programs in action -multinational - national-state-city and corporate levels. Market Implementation: Framework-factors influencing customer acceptance and response- program planning-monitoring and evaluation.

UNIT - V: Efficient Electric End – Use Technology Alternatives

Existing technologies – lighting - Space conditioning - Indoor air quality - Domestic water heating – hyper efficient appliances - Ductless residential heat pumps and air conditioners - Variable refrigerant flow air conditioning-Heat pump water heating - Hyper efficient residential appliances - Data center energy efficiency-LED street and area lighting - Industrial motors and drives - Equipment retrofit and replacement – Process heating - Cogeneration, Thermal energy storage - Industrial energy management programs – Manufacturing process-Electro- technologies, Residential, Commercial and industrial sectors.

Text Books:

1. The Smart Grid, Enabling Energy Efficiency and Demand Side Response, Clark WGellings,CRC Press, 2009.
2. Smart Grids, Jean Claude Sabonnadiere, Nouredine Hadjsaid, Wiley-ISTE, IEEEPress,May 2012.
3. SMART GRID Fundamentals of Design and Analysis, James Momoh, IEEE press, A JohnWiley &Sons, Inc., Publication, 2012.

Reference Books:

1. Smart Grid: Technology and Applications, Janaka Ekanayake, Kithsiri Liyanage,Jianzhong.Wu, Akihiko Yokoyama, Nick Jenkins, Wiley, 2012.
2. Smart Grid: Fundamentals of Design and Analysis, James Momoh, Wiley, IEEE Press,2012

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20EEOE12
Name of the Course	**Distribution Automation (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the basic principles of distribution and automation. **(K2)**
CO2: Describe the working functions of distribution automation. **(K2)**
CO3: Select appropriate Communication Technology for various parts of Distribution System for their automation. **(K2)**
CO4: Illustrate the technical benefits of Distribution Automation (DA). **(K2)**
CO5: Select an appropriate method for Economic Evaluation of DA plans. **(K2)**

UNIT-I: DISTRIBUTION AUTOMATION AND THE UTILITY SYSTEM

Introduction to Distribution Automation (DA), Control System Interfaces, Control and Data Requirements, Centralized (Vs) Decentralized Control, DA System (DAS), DA Hardware, DAS Software.

UNIT-II: DISTRIBUTION AUTOMATION FUNCTIONS

DA Capabilities, Automation System Computer Facilities, Management Processes, Information Management, System Reliability Management, System Efficiency Management, Voltage Management, Load Management, Management Process (Function) Interaction, Operating and Objective Priorities.

UNIT-III: COMMUNICATION SYSTEMS FOR DA

DA Communication Requirements - Communication Reliability, Cost Effectiveness, Data Rate Requirements, Two Way Capability, Ability to communicate during outages and faults, Ease of Operation and Maintenance, Conforming to the Architecture of Data Flow. Communication Systems used in DA - Distribution Line Carrier (Power line carrier), Ripple Control, Zero Crossing Technique, Telephone, Cable TV, Radio, AM Broadcast, FM SCA, VHF Radio, UHF Radio, Microwave, Satellite, Fibre Optics, Hybrid Communication Systems, Communication Systems used in Field Tests.

UNIT-IV: TECHNICAL BENEFITS

DA Benefit Categories, Capital Deferred Savings, Operation and Maintenance Savings, Interruption Related Savings, Customer-related Savings, Operational Savings, Improved Operation, Function Benefits, Potential Benefits for Functions, Function-shared Benefits, Guidelines for Formulation of Estimating Equations, Parameters Required, Economic Impact Areas, Resources for determining benefits, Integration of System Benefits into Economic Evaluation, Impact of DA on Distribution System.

UNIT-V: ECONOMIC EVALUATION METHODS

Development and Evaluation of Alternate Plans, Select Study Area, Select Study Period, Project Load Growth, Develop Alternatives, Calculate Operation and Maintenance Costs, Evaluate Alternatives. Economic Comparison of Alternate Plans: Classification of Expenses and Capital Expenditures, Comparison of Revenue Requirements of Alternative Plans, Book Life and Continuing Plant Analysis, Year-by- Year Revenue Requirement Analysis, Short Term Analysis, End of Study Adjustment, Break-Even Analysis, Sensitivity Analysis, Major Steps in Utility Economic Evaluation of DA (Flow-Chart) Computational Aids.

Text Books:

1. Dr.M.K. Khedkar and Dr.G.M.Dhole," A Textbook of Electric Power DistributionAutomation", University Science Press (Laxmi Publications Pvt. Ltd.), 2011
2. D. Bassett, K. Clinard, J. Grainger, S. Purucker, and D. Ward, "Tutorial Course:Distribution Automation", IEEE Tutorial Publication 88EH0280-8-PWR, 1988.

Reference Books:

1. James Northcote-Green, Robert Wilson "Control and Automation of Electrical PowerDistribution Systems" CRC Press, Taylor and Francis Group, 2007.
2. James A. Momoh "Electric Power Distribution, Automation, Protection, and Control", CRCPress, Taylor and Francis Group, 2017.

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20MEOE1
Name of the Course	**Basic Mechanical Engineering (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss different types of materials, their properties and testing withapplications. **(K2)**

CO2: Interpret concepts of thermodynamics, Refrigeration, air conditioning andworking of IC engines and air conditioners. **(K2)**

CO3: Illustrate different manufacturing, joining, machining processes and machineswith applications. **(K2)**

CO4: Explain concepts of force, power transmission and power plants. **(K2)**

CO5: Discuss the classification and working of pumps, turbines and gas turbines. **(K2)**

UNIT – I: ENGINEERING MATERIALS AND PROCESSES:

ENGINEERING MATERIALS: Ferrous metals (Mild steel, Cast iron and its types, Stainless steel, High carbon steel), Non ferrous metals and alloys (Copper, Zinc, Aluminium, Tin, Nickel and their alloys).

Properties- Strength, Hardness, Toughness, Brittleness, Creep, Fatigue, Stiffness, Ductility, Malleability, Elasticity, Plasticity, Specific gravity, Viscosity, Thermal conductivity, Specific heat, Corrosion resistance.

UNIT – II: THERMAL SCIENCE:

THERMODYNAMICS: System, Surroundings, Thermodynamic equilibrium, Property, State, Path, Process, Cyclic process, Work, Heat, Energy, Enthalpy, Entropy, Internal energy, Laws of thermodynamics (Description only), Scales of temperature.

IC ENGINES: Classification, Carnot, Otto, Diesel Cycles with P-V and T-S diagrams, 2 and 4 stroke C.I and S.I engines, working, Hybrid engines, Indicated power, Brake power, efficiencies.

REFRIGERATION AND AIRCONDITIONING: Refrigerant and its types with applications, Unit of refrigeration, COP, working of vapour compression refrigeration.

UNIT – III: MANUFACTURING SCIENCE: Basic description of manufacturing processes-Casting, Forging,Rolling, Extrusion, Hot and cold working processes with applications.

METAL JOINING PROCESSES: Basic description with sketches-Rivetting, Arc welding, Gas welding, Soldering and Brazing with applications.

UNIT – IV: FORCE AND POWER TRANSMISSION:

FORCE SYSTEM AND ANALYSIS: Concepts of- Laws of motion, Free body diagrams, Resultant force, Equilibrium, Friction, laws of friction, Stress, types of stress, Strain, Poisson's ratio, Elasticconstants, Moment, Moment of inertia, centroid, Torque.

POWER TRANSMISSION: Description of working with sketches-Belt, Chain drives, Gear trains with applications, Single plate clutches. Basic concepts of hydraulic and pneumatic power transmission.

UNIT – V: PUMPS AND PRIME MOVERS:

PUMPS: Classification of pumps, Description and working of- Reciprocating and centrifugal pumps with applications, priming, Multistage pumps., Discharge and coefficient of discharge.

PRIME MOVERS: Classification of hydraulic turbines, steam turbines, description and working of Pelton wheel and governing. Types of gas turbines and working of gas turbines with applications.

Text Books:

1. Thermal Engineering –Rajput RK, Laxmi publications.
2. Elements of Mechanical Engineering-Sadhu singh, S.chand publications.
3. Basic Mechanical Engineering –Pravin kumar, Pearson publications.
4. Elements of Mechanical Engineering-N.M. Bhatt and J.R.Mehta, Mahajan publishing house.

Reference Books:

1. Production Technology-P.C.Sharma
2. Thermal Engineering-PL Ballaney
3. Power Plant Engineering-Nagpal
4. Workshop Technology-Hajra choudhury

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20MEOE2
Name of the Course	**Green Engineering Systems (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Illustrate the concept of Solar Radiation, Collection, Storage and Applications. **(K2)**
CO2: Discuss the construction and working of wind energy and bio-energyconversion systems. **(K2)**
CO3: Describe the construction and working of Geothermal and Ocean Energy conversion systems. **(K2)**
CO4: Illustrate the principles of environmental impact of current manufacturing practices. **(K2)**
CO5: Discuss the features and benefits of green building materials and its applications. **(K2)**

UNIT – I: INTRODUCTION: SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, instruments for measuring solar radiation and sun shine, Flat plate and concentrating collectors.
SOLAR ENERGY STORAGE AND APPLICATIONS: Different Storage methods, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

UNIT – II: WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, types of winds.
BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, bio fuels, I.C. engine operation.

UNIT – III: GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential inIndia.
OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidaland wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT – IV: ENERGY EFFICIENT PROCESSES: Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, zero waste manufacturing.

UNIT – V: GREEN BUILDINGS: Definition, features and benefits. Sustainable site selection and planning of buildings for maximum comfort. Environmental friendly building materials like bamboo, timber, rammed earth, hollow blocks, lime & lime pozzolana cement, agro materials and industrial waste, Ferro cement and Ferro-concrete, alternate roofing systems, paints to reduce heat gain of the buildings.

Text Books:

1. Sukhatme S.P. and J.K.Nayak, Solar Energy – Principles of Thermal Collection and Storage,TMH.
2. Khan B.H., Non-Conventional Energy Resources, Tata McGraw Hill, New Delhi, 2006.
3. Green Manufacturing Processes and Systems, Edited by J. Paulo Davim, Springer 2013.

Reference Books:

1. Alternative Building Materials and Technologies / K.S Jagadeesh, B.V Venkata Rama Reddy andK.S Nanjunda Ra.
2. Principles of Solar Energy / Frank Krieth & John F Kreider.
3. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Renewable Energy Technologies/ G.D Roy

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20MEOE3
Name of the Course	**Computational Fluid Dynamics (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Apply techniques in the numerical solution of fluid equations. **(K3)**

CO2: Apply numerical modeling and its role in the field of heat transfer and fluid flow. **(K3)**

CO3: Develop methodologies used in CFD. **(K3)**

CO4: Compare various discretization methods and solving methodologies. **(K4)**

CO5: Apply skills in the actual implementation of CFD methods (e.g. boundary conditions, different numerical schemes etc., Finite element methods in theapplication of CFD analysis to real life engineering designs. **(K3)**

UNIT – I: ELEMENTARY DETAILS IN NUMERICAL TECHNIQUES: Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, condition and instability, computational methods for error estimation, convergence of sequences.

UNIT – II: APPLIED NUMERICAL METHODS: Solution of a system of simultaneous linear algebraic equations, iterative schemes of matrix inversion, direct methods for matrix inversion, direct methods for banded matrices.

EQUATIONS GOVERNING FLUID FLOW AND HEAT TRANSFER: Introduction, conservation ofmass, Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energyprinciple, special forms of the Navier – stokes equations.

UNIT– III: Steady flow, dimensionless form of momentum and energy equations, stokes equation, conservative body force fields, stream function - vorticity formulation. Finite difference applications in heat conduction and convention – heat conduction, steady heat conduction in a rectangular geometry, transient eat conduction, finite difference application in convective heat transfer, closure.

UNIT – IV: Finite differences, discretization, consistency, stability, and fundamentals of fluid flow modelling: introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

UNIT – V: Introduction to first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modelling, conservative property, the up wind scheme.

FINITE VOLUME METHOD: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, linear interpolation and quadratic interpolation.

Text Books:

1. Numerical heat transfer and fluid flow/Suhas V.Patankar- Butter –worth Publishers.
2. Computational fluid dynamics – Basics with applications -John. D.Anderson /McGraw Hill.

Reference Books:

1. Computational Fluid Flow and Heat Transfer/Niyogi, Pearson Publications.
2. Fundamentals of Computational Fluid Dynamics–Tapan K.Sengupta / Universities Press.
3. Computational fluid dynamics, 3rd edition/Wendt/Springer publishers

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20MEOE4
Name of the Course	**Rapid Prototyping (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand virtual prototyping and testing of technology. **(K2)**
CO2: Construct CAD modelling for rapid prototyping. **(K3)**
CO3: Examine different types of process in rapid prototyping. **(K3)**
CO4: Explain Rapid Manufacturing errors. **(K2)**
CO5: Express the applications of rapid prototyping. **(K2)**

UNIT – I: Introduction: Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Classification of Rapid Manufacturing Processes: Additive, Subtractive, Formative, Generic RP process.

UNIT – II: CAD Modelling and Data Processing for RP: CAD model preparation, Data interfacing: formats (STL, SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP), conversation, validity checks, repair procedures; Part orientation and support generation, Support structure design, Model Slicing algorithms and contour data organization, direct and adaptive slicing, Tool path generation.

UNIT – III: RP Processes: Process Physics, Tooling, Process Analysis, Material and technological aspects, Applications, limitations and comparison of various rapid manufacturing processes. Photo polymerization (Stereo lithography (SL), Micro stereo lithography), Powder Bed Fusion (Selective laser Sintering (SLS), Electron Beam melting (EBM)), Extrusion-Based RP Systems (Fused Deposition Modelling (FDM)), 3D Printing, Sheet Lamination (Laminated Object Manufacturing (LOM), Ultrasonic Consolidation (UC)), Beam Deposition (Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD)).

UNIT – IV: Errors in RP Processes: Pre-processing, processing, post-processing errors, Part building errors in SLA, SLS.

UNIT – V: Application of Rapid Prototyping and Technology: Functional models, pattern for investment and Vacuum casting, medical models, Art models, Engineering analysis models.

Reference Books:

1. Rapid Prototyping: Principles and Applications in Manufacturing. Chua C.K., Leong K.F.,Chu S. L., World Scientific.
2. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing.Gibson, Ian, Rosen, David, Stucker, Brent, Pearson
3. Rapid Prototyping: Principles and Applications in Manufacturing. Noorani R, John Wiley &Sons.
4. Rapid Prototyping and Engineering applications: A tool box for prototype development.Liou W.L., Liou F. W., CRC Press
5. Rapid Prototyping: Theory and practice. Kamrani A. K., Nasr E. A., Springer

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20MEOE5
Name of the Course	**Computer Aided Design (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Explain the basic fundamentals of CAD tools. **(K2)**

CO2: Find the characteristics of curves, Representation and continuity requirements. **(K3)**

CO3: Illustrate the Geometric Transformations and demonstrate various types of surfaces and Representation. **(K3)**

CO4: Differentiate between the methods of representing Solid Modelling**.** **(K4)**

CO5: Apply the local and global properties for product development. **(K3)**

UNIT – I: CAD Introduction: Need of machine design, use of computer, computer fundamentals, computer aided design process, CAD configuration, and CAD tools, positive and negative points of CAD, CAD and CAM integration.

UNIT – II: DESIGN OF CURVES: Fundamental of Curve Design, Parametric Space of a Curve, Representation, Parametric cubic curve, Blending functions, Truncation, extension, and subdivision, composite curve: continuity requirements .

UNIT – III: GEOMETRIC TRANSFORMATIONS: Translation, Rotation, Scaling Symmetry and Reflection, Homogeneous Transformations. Orthographic Projections, Axonometric Projections, Oblique Projections, Perspective Transformation.

DESIGN OF SURFACES: Fundamental of Surface Design, Parametric Space of a Surface, Representation of a Surface patch, sixteen point form, Four Curve Form, Plane.

UNIT – IV: SOLID MODELLING: Solid Modelling fundamentals, topology and geometry. Geometric Modelling Method, Constructive Solid Geometry (CSG), Boundary Representation (Brep), Introduction to Wireframe,surface and solid modelling techniques. Introduction CAD data exchange format IGES, STEP

UNIT – V: GEOMETRIC PROPERTIES: Local and global properties of a curve, Local and global properties of a surface, Global properties of complex solids, Relational properties, intersections. Applications in Product Development and other areas.

Reference Books:

1. Geometric Modeling: Michael E. Mortenson, Third Edition, Industrial Press Inc.2006.
2. Mathematical Elements of Computer Graphics, Rogers and Adams, McGraw Hill. 1994
3. CAD CAM Theory and Prectice: I. Zeid, Tata-McGraw Hill, 2006
4. Computer-Aided Engineering Design, B Sahay and ASaxena, Springer, 2005.
5. Differential Geometry of Curves and Surfaces, Thomas F. Banchoff and Stephen T. Lovett, ThomasBanchoff-Stephen Lovett, 2010.
6. Computational Geometry for Design and Manufacture, I.D. Faux and M.J. Pratt, John Wiley, 1980.
7. Lectures on Classical Differential Geometry, Dirk J. Struick, Addison Wesley, 1980.

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	3	0	0	3	V20MEOE6
Name of the Course	**Mechatronics (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the elements of Mechatronics & levels and explain varioustypes of sensors , transducers and Mechatronics design process. **(K2)**

CO2: Sketch and explain various types of solid state devices like Diode, BJT,MOSFET, etc. **(K3)**

CO3: Illustrate and explain basic principles of Hydraulic, pneumatic, electrohydraulic, electro hydraulic servo actuating systems. **(K3)**

CO4: Illustrate and explain microprocessors, microcontrollers and PLC. **(K3)**

CO5: Sketch and explain System interfacing and data acquisition systems. **(K3)**

UNIT – I: MECHATRONICS SYSTEMS – elements & levels of mechatronics system, Mechatronics design process, system, measurement systems, control systems, advantages and disadvantages of mechatronics systems. Sensors and transducers, types, displacement, velocity, force, acceleration, liquid flow, liquidlevel, temperature and light sensors.

UNIT– II: SOLID STATE ELECTRONIC DEVICES - PN junction diode, BJT, FET, Analog signal conditioning, operational amplifiers, filters.

UNIT– III: HYDRAULIC AND PNEUMATIC ACTUATING SYSTEMS - Fluid systems, Hydraulic systems, and pneumatic systems, components, control valves, electro-pneumatic, hydro-pneumatic, electro-hydraulic servo systems.

UNIT– IV: DIGITAL ELECTRONICS AND SYSTEMS - Digital logic control, micro processors and micro controllers, programming, programmable logic controllers, PLCs versus computers, application of PLCs for control.

UNIT– V: SYSTEM AND INTERFACING AND DATA ACQUISITION – Data Acquisition Systems, Analog to Digital and Digital to Analog conversions; Digital Signal Processing.

Text Books:

1. MECHATRONICS Integrated Mechanical Electronics Systems/KP Ramachandran, GK Vijaya Raghavan & MS Balasundaram/WILEY India Edition

Reference Books:

1. Mechatronics /Smaili A, Mrad F/ Oxford Higher Education, Oxford University Press
2. Mechatronics Source Book / Newton C Braga/Thomson Publications, Chennai.
3. Mechatronics – N. Shanmugam / Anuradha Agencies Publishers.
4. Mechatronics System Design / Devdas shetty/Richard/Thomson.
5. Mechatronics/M.D.Singh/J.G.Joshi/PHI.
6. Mechatronics – Electronic Control Systems in Mechanical and Electrical Engg. 4th Edition / W.Bolton / Pearson, 2012
7. Mechatronics – Principles and Application / Godfrey C. Onwubolu/Elsevier, Indian print

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	2	0	2	3	V20ECTOE01
Name of the Course	**Internet of Things (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe M2M and IOT Technologies. **(K2)**
CO2: Identify the layers and protocols in IOT. **(K2)**
CO3: Describe various communication technologies used in IOT**.** **(K2)**
CO4: Demonstrate various hardware components required for IOT applications. **(K2)**
CO5: Identify the cloud technologies & explain the applications of IoT**.** **(K2)**

UNIT I: INTRODUCTION

Introduction from M2M to IoT - An Architectural Overview, building architecture, Main design principles and needed capabilities, An IoT architecture outline, M2M and IoT Technology Fundamentals - Devices and gateways

UNIT II: IOT PROTOCOLS

Functionality of Layers in IoT –Study of protocols - Wireless HART, Z-Wave, 6LoWPAN, RPL, CoAP, MQTT.

UNIT III: COMMUNICATION TECHNOLOGIES IN IOT

IoT Connectivity – IEEE 802.15.4, Wi-Fi, Bluetooth, Zigbee, LPWAN, 5G Era.

UNIT IV: SYSTEM HARDWARE

Sensors, Actuators, Radio Frequency Identification, Introduction to Embedded Devices for IoT - RASPBERRY PI.

UNIT V: Cloud Computing & Case Studies

Data Collection, Storage and Computing Using a Cloud Platform for IoT Applications/Services. Real-time applications of IoT - Smart and Connected Cities, Agriculture.

Text Books:

1. "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence" Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle , 1st Edition, Academic Press, 2014.
2. IOT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, Cisco Press 800 East 96th Street Indianapolis, USA.
3. "Internet of Things (A Hands-on- Approach)", Vijay Madisetti and ArshdeepBahga, 1st Edition, VPT, 2014.

Reference Books:

1. From Internet of Things to Smart Cities: Enabling Technologies - edited by Hongjian Sun, Chao Wang, Bashar I. Ahmad, CRC Press -2018.
2. "Architecting the Internet of Things", Bernd Scholz-Reiter, Florian Michahelles, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer.
3. IOT (Internet of Things) Programming: A Simple and Fast Way of Learning IOT, David Etter.

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	2	0	2	3	V20ECTOE02
Name of the Course	**Communication Systems (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Demonstrate the fundamentals of communication systems. **(K2)**
CO2: Compare the various analog modulation and demodulation schemes. **(K2)**
CO3: Compare the various digital modulation and demodulation schemes. **(K2)**
CO4: Explain the wireless communication system concepts. **(K2)**
CO5: Outline the satellite & Optical communication system principles. **(K2)**

UNIT-I: Fundamentals of Communication systems: Block diagram of communication system; types of communications - analog and digital; Noise–types of noise, sources of noise, and noise figure.

UNIT-II: Fundamentals of Analog Communication: Need for modulation; Types of analog modulation techniques (AM, FM & PM). Sampling theorem, Nyquist criteria, introduction to PAM, PWM and PPM.

UNIT-III: Fundamentals of Digital Communication: Advantages; Working principle of PCM; introduction to digital modulation techniques-ASK, FSK, &PSK.

UNIT-IV: Fundamentals of Wireless Communication: Evolution of mobile communications, Mobile Radio System around the world, Comparison of Common wireless system, Concepts of 1G, 2G, 3G, 4G. , Introduction to 5G.

UNIT-V: Fundamentals of Satellite & Optical communication: Brief history of Satellite systems; Principles, architecture. Fundamentals of Optical Communication: Evolution of fiber optic system, Elements of an Optical Fiber Transmission link and Reception link.

Text Books:

1. Principles of Communications by H. Taub and D. Schilling, TMH, 2003.
2. Wireless Networks: Applications and Protocols by T. S. Rappaport, Pearson Education
3. Satellite Communications by Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
4. Optical Fiber Communication by Gerd Kaiser (TMH)

References:

1. Electronic Communication Systems by Kennedy and Davis, TMH, 4th edition, 2004.
2. Wireless Communication and Networks: 3G and Beyond by I. SahaMisra, TMH Education.
3. Satellite Communications: Design Principles by M. Richharia, B S publications, 2nd Edition, 2003.

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	2	0	2	3	V20ECTOE03
Name of the Course	**Principles of Image Processing (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Understand the different Transforms Techniques & their use in Image Processing Applications. **(K2)**

CO2: Describe Spatial and frequency domain filtering like smoothing and sharpening operations on Images. **(K2)**

CO3: Describe Restoration operations/techniques on Images. **(K2)**

CO4: Describe the Image compression Techniques and Image segmentation. **(K2)**

CO5: Explain the different color Image Processing Techniques. **(K2)**

UNIT-I: Introduction

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing.

Image Transforms: Discrete Fourier transform (DFT) and Discrete Cosine transform.

UNIT-II: Image Enhancement Techniques

Intensity Transformations and Spatial Filtering: Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters and sharpening spatial filters.

Filtering in the Frequency Domain: image smoothing using frequency domain filters, Image Sharpening using frequency domain filters.

UNIT-III: Image Restoration

Image Restoration : A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering. Estimating the image degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering.

UNIT-IV: Image compression and Segmentation

Image compression: Fundamentals, Basic compression methods: Huffman coding, Arithmetic coding, LZW coding **a**nd subband coding.

Image segmentation: Fundamentals, point, line, edge detection, thresholding, based segmentation and simple morphological operations : Erosion and dilation, opening and closing.

UNIT-V: Color Image Processing

Color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening.

Text Books:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw Hill Education, 2011.

Reference Books:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	2	0	2	3	V20ECTOE04
Name of the Course	**Medical Electronics (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Explain the basics concepts of Bio-Medical Instrumentation. **(K2)**

CO2: Explain the concepts of electrode theory, classification of Electrodes and Transducers used in Bio-Medical Applications. **(K2)**

CO3: Explain the Anatomy and Physiology of Cardiovascular system and Illustrate the application of Bio-Medical Instruments to measure the Physiological parameters of Cardiovascular System. **(K2)**

CO4: Discuss the elements used for Patient's Health care &monitoring. **(K2)**

CO5: Classify different types of monitors, discuss the principals of recorders and Illustrate the methods of accident preventions. **(K2)**

UNIT-I:

INTRODUCTIONTOBIOMEDICALINSTRUMENTATION: AgeofBiomedicalEngineering,Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Bioelectric Potentials-ECG, EEG and EMG,

UNIT-II:

ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Bio potential Electrodes, Examples of Electrodes, Basic Transducer Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output.

UNIT-III:

CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electrocardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sounds, Plethysmography.

UNIT-IV:

PATIENTCAREANDMONITORING: ElementsofIntensive-CareMonitoring,PatientMonitoringDisplays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators.

UNIT-V:

DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Rayand Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring

Text Books:

1. Bio-Medical Electronics and Instrumentation, OnkarN.Pandey, RakeshKumar, KatsonBooks.
2. Bio-Medical Instrumentation, Cromewell, Wiebell, Pfeiffer

References:

1. "Hand Book of Bio-Medical Instrumentation", Khandapur. McGrawHill
2. "Introduction to Bio- Medical Equipment Technology", 4th Edition, Joseph J.Carr, John M.Brown, Pearson Publications.

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	2	0	2	3	V20ECTOE05
Name of the Course	**Principles of Wireless Communications (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Discuss the cellular system evolution of mobile radio systems. **(K2)**
CO2: Illustrate the basic cellular concepts. **(K2)**
CO3: Explain the Various Propagation models. **(K2)**
CO4: Discuss the need of modulation, diversity and equalization in cellular & Mobile Communication. **(K2)**
CO5: Demonstrate the knowledge about GSM architecture, &upcoming technologies like 3G, 4G etc. **(K2)**

UNIT-I: Introduction of Wireless Communication History and evolution of mobile radio systems: Types of mobile wireless services/systems, WLL, Paging, Satellite systems.

UNIT-II: Cellular Concepts and System Design Fundamentals: Cellular concept and frequency reuse, channel assignment, handoff strategies, cell splitting, cell sectoring.

UNIT-III: Mobile radio Propagation Models: Radio wave propagation issues in personal wireless systems, Propagation models, Multipath fading.

UNIT-IV: Overview analog and digital modulation techniques Need For Modulation.

UNIT-V: Digital cellular networks: GSM architecture, GSM Services, multiple access schemes; FDMA, TDMA, CDMA, OFDMA;
Higher Generation Cellular Standards: 3G System architecture (UMTS), 4G System Architecture, Introduction to 5G.

Text Books:

1. Theodore S. Rappaport, ―wireless communications Principles and Practices‖, PHI, 2005
2. Jochen Schiller, ―Mobile Communications‖, Pearson Education, second edition, 2009.

Reference Books:

1. Lee W.C.Y, ―Mobile communication Engineering
2. Theory and Applications‖, 2/e McGraw-Hill,New York, 2003
3. Andreas F. Molisch, ―Wideband Wireless Digital Communication‖, Pearson Education 2001.

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	2	0	2	3	V20ECTOE06
Name of the Course	**Basics of VLSI Design (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Identify the CMOS layout levels, and the design layers used in the process sequence. **(K2)**
CO2: Describe the general steps required for processing of CMOS integrated circuits. **(K2)**
CO3: Outline static CMOS combinational and sequential logic at the transistor level. **(K1)**
CO4: Demonstrate different logic styles such as complementary CMOS logic, pass-Transistor Logic, dynamic logic, etc. **(K3)**
CO5: Interpret the need for testability and testing methods in VLSI. **(K3)**

UNIT-I: Moore's law, speed power performance, n-MOS fabrication, CMOS fabrication: n-well, well processes, Bi-CMOS, Comparison of bipolar and CMOS. Basic Electrical Properties of MOS And Bi-CMOS Circuits: Drain to source current versus voltage characteristics, threshold voltage, trans conductance.

UNIT-II: Basic Electrical Properties of MOS And Bi-CMOS Circuits: n-MOS inverter, Determination of pull up to pull down ratio: n-MOS inverter driven through one or more pass transistors, alternative forms of pull up, CMOS inverter, Bi-CMOS inverters, latch up.
Basic Circuit Concepts: Sheet resistance, area capacitance calculation, Delay unit, inverter delay, estimation of CMOS inverter delay, super buffers, Bi-CMOS drivers.

UNIT-III: MOS and Bi-CMOS Circuit Design Processes: MOS layers, stick diagrams, n-MOS design style, CMOS design style Design rules and layout & Scaling of MOS Circuits: λ - based design rules, scaling factors for device parameters

UNIT-IV: Subsystem Design and Layout-1: Switch logic pass transistor, Gate logic inverter, NAND gates, NOR gates, pseudo n-MOS, Dynamic CMOS Examples of structured design: Parity generator, Bus arbitration, multiplexers, logic function block, code converter.

UNIT-V: Subsystem Design and Layout-2: Clocked sequential circuits, dynamic shift registers, bus lines, General considerations, 4-bit arithmetic processes, 4-bit shifter, Regularity- Definition & Computation Practical aspects and testability: Some thoughts of performance, optimization and CAD tools for design and simulation.

Text Books:

1. "Basic VLSI Design", Douglas A Pucknell, Kamran Eshraghian, 3rd Edition, Prentice Hall of India publication, 2005.

References:

1. "CMOS Digital Integrated Circuits, Analysis And Design", Sung – Mo (Steve) Kang, Yusuf Leblebici, Tata McGraw Hill, 3rd Edition, 2003.
2. "VLSI Technology", S.M. Sze, 2nd edition, Tata McGraw Hill, 2003.

Semester	V- VII	L	T	P	C	COURSE CODE
Regulation	V20	2	0	2	3	V20ECTOE07
Name of the Course	**Concepts of Embedded Systems (Open Elective)**					
Branch	Common to All Branches					

Syllabus Details

Course Outcomes: After Successful completion of the Course, the student will be able to:

CO1: Describe the Basic Concepts of embedded systems. **(K2)**
CO2: Describe the characteristics of Application & Domain-Specific Embedded Systems. **(K2)**
CO3: Explain the various elements of embedded hardware and their design principles. **(K2)**
CO4: Explain various software design approaches in embedded environment. **(K2)**
CO5: Discuss various tools used for Embedded system implementation and testing. **(K2)**

UNIT I: INTRODUCTION TO EMBEDDED SYSTEMS:

Introduction to Embedded Systems, Classification of Embedded systems, Major application areas of embedded systems, Purpose of embedded Systems, The Typical embedded system - core of the embedded system, Difference between RISC and CISC, Types of Memories.

UNIT II: CHARACTERISTICS OF EMBEDDED SYSTEM:

Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT III: EMBEDDED HARDWARE DESIGN:

Analog Electronic Components, Digital electronic components, I/O types and examples, Serial communication devices (I2C, SPI, USB), GPRS, Watchdog timer, Real time Clock, Sensors and Actuators.

UNIT IV: EMBEDDED FIRMWARE DESIGN:

Embedded Firmware design approaches, Embedded Firmware development languages: Assembly level and High-level Programming Language, Advantages and Drawbacks of development languages, Concepts of C versus Embedded C and Compiler versusCross-compiler.

UNIT V: EMBEDDED SYSTEM IMPLEMENTATION AND TESTING:

The main software utility tools - IDE and CAD, Translation tools - Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, ElsevierPublications,2013
2. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited,2013.

References:

1. Embedded Systems: Architecture, Programming and Design by Raj Kamal, Tata McGraw-Hill Education, 2011.
2. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications,2013.
3. Embedded/Real Time Systems by KVKK Prasad by Dreamtech Publication