SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)
(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)
Accredited by NAAC with 'A' Grade
UG Programmes CE,CSE,ECE,EEE,IT & ME are Accredited by NBA
Chinna Amiram, Bhimavaram-534204. (AP)
Estd:1980

Regulation: R20	**I / IV - B.Tech. I - Semester**

COMPUTER SCIENCE & BUSINESS SYSTEM

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2020-21 admitted Batch onwards)

Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20 BS 1104	Discrete Mathematics	BS	3	3	0	0	30	70	100
B20 BS 1105	Introductory Topics in Statistics, Probability & Calculus	BS	3	3	0	0	30	70	100
B20 BS 1106	Fundamentals of Physics	BS	3	3	0	0	30	70	100
* B20 EE 1103	Principles of Electrical Engineering	ES	3	2	0	0	30	70	100
				0	0	2	15	35	50
B20 CB 1101	Fundamentals of Computer Science & Programming	ES	3	3	0	0	30	70	100
B20 HS 1102	Business Communication & Value Science - I Lab	HS	1.5	0	0	3	15	35	50
B20 BS 1109	Fundamentals of Physics Lab	BS	1.5	0	0	3	15	35	50
B20 CB 1102	Fundamentals of Computer Science & Programming Lab	ES	1.5	0	0	3	15	35	50
		TOTAL	**19.5**	**14**	**0**	**11**	**210**	**490**	**700**

Note: *- Integrated course and its evaluation guide lines are mentioned in the Syllabus

Course Code	Category	L	T	P	C	I.M	E.M.	Exam
B20BS1104	**BS**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DISCRETE MATHEMATICS

(For CSBS)

Course Objectives: Students are expected to learn

1.	To check the validity of arguments by using basic connective and valid rules of inference.
2.	To impart knowledge on Boolean algebra and their properties.
3.	To observe various properties of sets and relations.
4.	To know different algebraic structures and their properties.
5.	To understand different counting Techniques.
6.	To identify different graphs, isomorphism of graphs, paths, cycles and circuits.

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

S.No	Outcome	K L
1	Translate the arguments using propositions and predicates to verify their validity.	K3
2	Utilize Boolean expressions and their simplifications.	K3
3	Make use of sets & relations in different functioning procedures.	K3
4	Illustrate the properties of Groups, Rings, Fields.	K3
5	Solve different counting problems and recurrence relations.	K3
6	Apply graph theory techniques to solve some problems related to computer science.	K3

SYLLABUS

UNIT-I (10Hrs)	**Logic:** Propositional calculus - propositions and connectives, syntax; Semantics – truthassignments and truth tables, validity and satisfiability, tautology; Adequate set of connectives; Equivalence and normal forms; Compactness and resolution; Formal reducibility - natural deduction system and axiom system; Soundness and completeness.
UNIT-II (08Hrs)	**Boolean algebra:** Introduction of Boolean algebra, truth table, basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map.
UNIT-III (10Hrs)	**Abstract Algebra:** Set, relations and their properties, binary operations, algebraic system, semi group, monoid, groups and their properties, subgroup, simple examples, ring – definition and example, field – definition and example.
UNIT-IV (10Hrs)	**Combinatorics:** Basic counting, balls and bins problems, generating functions, recurrence relations, Methods of solving recurrence relations, principle of mathematical induction, pigeonhole principle, principle of inclusion-exclusion and related problems.
UNIT-V (12 Hrs.)	**Graph Theory:**Graphs and digraphs, complement, isomorphism, connectedness and reachability,adjacency matrix, Eulerian paths and circuits in graphs and digraphs, Hamiltonian paths and circuits in graphs and tournaments, trees and their properties; Planar graphs, Euler's formula, dual of a planer graph, independence number and clique number, chromatic number, statement of Four-color theorem.

Text Books:	
1.	Trembly J.P. & Manohar, Discrete Mathematical Structures with applications to computer science, 1/e, McGraw Hill Education, 2017.
2.	I. N. Herstein, Topics in Algebra, 2/e, John Wiley and Sons, 1975.
3.	M. Morris Mano,Digital Logic & Computer Design, 1/e, Pearson, 2004.
4.	J. A. Bondy and U. S. R. Murty, Graph Theory with Applications, 5/e, Macmillan Press, London, 1982.
Reference Books:	
1.	Gilbert Strang, Introduction to linear algebra, 4/e, Wellesley-Cambridge Press, 2009.
2.	R. A. Brualdi, Introductory Combinatorics, 1/e, North-Holland, New York, 1977.
3.	N. Deo,Graph Theory with Applications to Engineering and Computer Science, 1/e, Prentice Hall, Englewood Cliffs, 2016.
4.	E. Mendelsohn, Van-Nostrand,Introduction to Mathematical Logic,4/e, Chapman & Hall, London, 1957.
5.	C. L. Liu, Elements of Discrete Mathematics, 2/e, McGraw Hill, New Delhi, 2011.
6.	L. Zhongwan, Mathematical Logic for Computer Science, World Scientific, Singapore, 1989.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20BS1105	**BS**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

INTRODUCTORY TOPICS IN STATISTICS, PROBABILITY AND CALCULUS

(For CSBS)

Course Objectives: Students are expected to

1.	Familiarize themselves with the foundations of statistical methods and their representation.
2	Get an idea of basic concepts of probability and their applications.
3	Know the concepts of Mathematical expectation and Moment generating function.
4	Learn various statistical measures of a few discrete distributions
5	Learn various statistical measures of a few continuous distributions
6	Gain knowledge of basic concepts of calculus as these concepts lay a strong foundation in Engineering applications.

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

S.No	Outcome	K L
1	Understand the concepts of data science and their applications.	K3
2	Make use of the concepts of probability and their applications.	K3
3	Understand the concepts of Expectations and Moment generating function. Apply discrete probability distributions.	K3
4	Predict the discrete distribution suitable for the given data from its moments.	K3
5	Predict the continuous distribution suitable for the given data from its moments	K3
6	Understand the concepts of calculus and application of double integral.	K3

SYLLABUS

UNIT-I (12 Hrs)	**Introduction to Statistics:** Definition of Statistics. Basic objectives. Applications in various branches of science with examples. Collection of Data: Internal and external data, Primary and secondary Data. Population and sample, Representative sample. Descriptive Statistics: Classification and tabulation of univariate data, graphical representation, Frequency curves. Central tendency (Mean, Median and Mode) and dispersion (S.D, M.D, Q.D and Range). Bivariate data. Summarization, marginal and conditional frequency distribution.
UNIT-II (10Hrs)	**Probability**: Concept of experiments, sample space, event. Classical definition of Probability, axiomatic approach. Addition and Multiplication laws of Probability Conditional Probability, Baye's Theorem.
UNIT-III (12 Hrs)	**Expected values and moments:** Review of basic concepts of Random Variable **(no questions may be set on review).** Mathematical expectation and its properties, Moments (including variance) and their properties, interpretation, Moment generating function. **Discrete Probability Distributions:** Binomial, Poisson and Geometric distributions - Definition, Mean, Variance, moments, m.g.f., Characteristic function and applications.

UNIT-IV (12 Hrs)	**Continuous Probability Distributions:** Uniform Distribution-Mean, variance and moments. Normal Distribution- Mean, Variance, m.g.f., Characteristic function, Applications of Normal Distribution. Exponential Distribution- Mean, Variance and Memory less property of Exponential distribution. Chi-square, Student - t and F Distributions-Definition, Characteristics like mean, variance and applications **(without proofs)**.
UNIT-V (12Hrs)	Multi variable calculus– Functions of two variables, Partial differentiation, Homogeneous functions, Total derivative, Jacobians, Maxima and Minima of functions two variables. Basic Concepts of Double integrals, change of variables, change of order of integration and applications of double integral to find Areasof plane regions.
Text Books:	
1.	Fundamentals of Mathematical Statistics by S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons Publishers.
2.	A. Goon, M. Gupta and B. Dasgupta, Fundamentals of Statistics, vol. I & II, 1/e, World Press,2013.
3.	B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publication, Delhi,1965.
4	Introduction of Probability Models, S.M. Ross, 10/e, Academic Press, N.Y,2010.
Reference Books:	
1.	S.M. Ross, A first course in Probability,8/e, Prentice Hall, 2010.
2.	I.R. Miller, J.E. Freund and R. Johnson, Probability and Statistics for Engineers, 9/e, PHI, 2017.
3.	A.M. Mood, F.A. Graybill and D.C. Boes, Introduction to the Theory of Statistics, 3/e, McGraw Hill Education, 1973.
4.	Peter V. O'Neil, Advanced Engineering Mathematics, 7/e, Thomson Learning, 2011
5.	M. D. Greenberg, Advanced Engineering Mathematics, 2/e, Pearson Education, 2002.
6.	P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Vol. I & II, Vidyarthi Prakashan.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20BS1106	**BS**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

FUNDAMENTALS OF PHYSICS

(For CSBS)

Course Objectives:

1.	Teaches the fundamentals of oscillatory systems and the analogy of mechanical andelectrical systems
2.	Explains the wave optics phenomena of interference, diffraction and polarization
3.	Delineates the fundamentals of quantum mechanics, crystallography and solid statePhysics
4.	Describes the fundamentals of lasers and few commonly used lasers
5.	Introduces the optical fibers and their applications
6	Introduces the three laws of thermodynamics and their applications to a heat engine

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

S.No	Outcome	K L
1.	Use the fundamentals of oscillatory systems and the analogy of mechanicaland electrical systems	K3
2.	Use interference, diffraction and polarization in optical systems	K3
3.	Apply the fundamentals of quantum mechanics, crystallography and solidstate physics	K3
4.	Describe the working of a few commonly used lasers	K3
5.	Classify optical fibers and describe their applications	K3
6	Use the three laws of thermodynamics and apply them to a heat engine	K3

SYLLABUS

UNIT-I (9 Hrs)	**Oscillations:** Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple spring-mass system, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, forced oscillations and resonance in mechanical and electrical systems, quality factor.
UNIT-II (10 Hrs)	**WaveOptics:**Theoryofinterferencefringes-typesofInterference-Fresnel'sprism Newton'srings,Diffraction-twokindsofdiffraction-Differencebetweeninterference and diffraction- Fraunhofer diffraction at single slit, plane diffraction grating; temporal and spatial coherence; **Polarization** - concept of production of polarized beam of light from two SHM actingatrightangle;plane,ellipticalandcircularlypolarizedlight,Brewster'slaw,double refraction.
UNIT-III (10 Hrs)	**Quantum Mechanics:** Introduction-Planck's quantum theory-Matter waves, de-Broglie wave length, Heisenberg's Uncertainty principle, time-independent and time-dependent Schrödinger wave equation, physical significance of wave function, particle in a one dimensional potential well, Heisenberg picture. **Crystallography:** Basic terms-types of crystal systems, Bravais lattices, Miller indices, d-spacing, Atomic packing factor for SC, BCC, FCC and HCP structures. **Solid State Physics**: Conductor, Semiconductor and Insulator; Basic concept of Band theory.

UNIT-IV (10 Hrs)	**Lasers and Fiber Optics:** Einstein's theory of matter-radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby, CO2 and Neodymium lasers; properties of laser beams: mono- chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in engineering. Fiber optics and applications, types of optical fibers.
UNIT-V (9 Hrs)	**Thermodynamics:** Zeroth law of thermodynamics, first law of thermodynamics, brief discussion on application of first law, second law of thermodynamics and concept of engine, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

Text Books:	
1.	A Beiser, Concepts of Modern Physics, 5/e, McGraw Hill International, 1995.
2.	David Halliday, Robert Resnick and Jearl Walker, Fundamentals of Physics, 10/e, Wileyplus, 2013.
Reference Books:	
1.	AjoyGhatak, Optics, 5/e, Tata McGraw Hill, 2012.
2.	Sears &Zemansky University Physics, Addison-Wesley.
3.	Jenkins and White, Fundamentals of Optics, 3/e, McGraw-Hill, 1957.
e-Resources:	
1.	http://library.iiti.ac.in/
2.	https://onlinecourses.nptel.ac.in/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EE1103	ES	2	--	2	3	Theory: 30	Theory: 70	Theory: 3 Hrs.
						Lab:15	Lab:35	Lab: 3 Hrs.

PRINCIPLES OF ELECTRICAL ENGINEERING

(For CSBS)

Introduction:

This course introduces the student, the fundamentals of electrical engineering concepts needed for future courses to be learned. The first three units cover the fundamentals of electric circuits, circuit laws and theorems. The next two units cover the principles of Electrostatic and electromagnetism with basics learning of single phase transformer and measurement of electrical quantities, electrical safety, and batteries.

Course Objectives: Students are expected to

1.	Study the basic DC and AC Electrical circuits and Understand the basic electrical laws and Theorems.
2.	Study the Sinusoidal steady state response for RL,RC,RLC series circuits and Determine the parameters of iron core inductor.
3.	Demonstrate the concepts of electrostatics and electromagnetism and Determine the performance of single phase transformer.
4.	Acquaint the knowledge about the measurement of electrical quantities and Determine single phase AC power.
5.	Demonstrate the concept of electrical safety.

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

S.No	Outcome	KL
1	**Apply** Mesh and Nodal analysis to solve the circuits and conduct experiments to verify Ohm's law and Kirchhoff's laws for electrical circuits.	K3,K4
2	**Apply** Network theorems and transformation techniques to solve DC circuits and conduct experiments to verifyNetwork theorems for given electrical circuits.	K3,K4
3	**Calculate** form factor, peak factor and determine power in AC circuits and conduct experiment to measure the power in AC circuit and determine the parameters of iron core inductor.	K3,K4
4	**Apply** the concepts of electrostatics and electromagnetism to understand the operation of capacitor and transformer and conduct the experiment to determine the performance of single phase transformer.	K3,K4
5	**Understand and apply** electrical safety measures while handling electrical equipment.	K3

SYLLABUS (Theory)

UNIT-I (10 Hrs)	**Basic concepts of Electrical circuits:** Concept of Potential difference, voltage, current, Fundamental linear passive and active elements to their functional current-voltage relation, voltage sources and current sources, ideal and practical sources, concept of dependent and independent sources, Kirchhoff-s laws and applications to network solutions using mesh and nodal analysis, Concept of work, power and energy.

UNIT-II (10 Hrs)	**DC Circuits:** Current-voltage relations of the electric network by mathematical equations to analyze the network (Thevenin's theorem, Norton's Theorem, Maximum Power Transfer theorem), Superposition theorem. Simplifications of networks using series-parallel, Star/Delta transformation.
UNIT-III (10 Hrs)	AC Circuits: AC waveform definitions, form factor, peak factor, study of R-L, R-C,RLC series circuit, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor. Introduction to 3 phase Balanced AC Circuits, voltage and current relations (Y-Δ connection)
UNIT-IV (10 Hrs)	**Electrostatics and Electromagnetism:** Electrostatic field, electric field strength, concept of permittivity in dielectrics, capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors. Magnetic field and Faraday's law, self and mutual inductance. Single phase transformer, principle of operation, EMF equation, voltageratio, current ratio, KVA rating, efficiency. Principle of batteries, types and applications.
UNIT-V (10 Hrs)	**Measurements, Sensors and Safety:** Introduction to measuring devices/sensors and transducers (Piezoelectric and thermo-couple) related to electrical signals, Elementary methods for the measurement of single-phase power. Electrical Wiring: Basic layout of the distribution system, necessity of earthing, types of earthing, Safety devices & system.

	SYLLABUS (Laboratory)
1.	Verification of Kirchhoff's laws.
2.	Ohm's law and resistance of a filament lamp.
3.	Verification of Superposition theorem.
4.	Verification of Thevenin's theorem.
5.	Verification of Norton's theorem.
6.	Verification of Maximum power transfer theorem.
7.	Parameters of iron core inductor.
8.	Sinusoidal steady state response of R-L-C series circuit.
9.	Step Response of RC circuit.
10.	Verification of line and phase voltage, line and phase current relationships in a three phase balanced star and delta connected circuits.
11.	Load test on a single phase transformer.

Text Books:

1.	Fundamentals of Electric circuits, Charles K. Alexander & Matthew N. O. Sadiku, 5/e, McGraw-Hill Book Company Inc., 2013.
2.	Basic Electrical Engineering, V. K. Mehta & Rohit Mehta 6/e, S. Chand and Company Ltd., New Delhi, 2012.
3.	Dr.Patranabis, "Sensors and Transducers" Second edition, PHI publications, 2001

Reference Books:

1.	William H. Hayt & Jack E. Kemmerly, Engineering Circuit Analysis, 8/e, McGraw-Hill Book

	Company Inc., 2013.
2.	Network Analysis, A Sudhakar & Shyam Mohan S Palli, 3/e, McGraw Hill Book Company Inc.,2015
3.	T. K. Nagsarkar and M. S. Sukhija, Basic of Electrical Engineering, 2/e, Oxford University Press, 2011.
4.	Basic Electrical Engineering, C L Wadhwa, 4/e, New Age International Publishers, 2007

Evaluation guidelines for the integrated course:

The Student has to pass both theory and lab examinations separately in order to complete the Integrated Course. If the Student fails in either theory or lab, he/she has to reappear for both theory and lab in supplementary examinations. Student will be declared as pass only when he/she completes both theory and lab at the same time.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CB1101	**ES**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

FUNDAMENTALS OF COMPUTER SCIENCE & PROGRAMMING

(For CSBS)

Introduction:

The course is designed to enable the student to develop logic and convert it into programs for problem solving. After the fundamentals of algorithms and flowcharts are introduced, the characteristics of imperative programming languages are taught with the C programming language. The course also lays down the foundation for working with the Unix operating system with basic file I/O and the make file utility.

Course Objectives:

1.	Introduce the student to algorithm development for problem solving
2.	Familiarize the student with the modular approach to program design
3.	Acquaint the student with various programming constructs in C language
4.	Enable the student to convert logic into C language code
5.	Familiarize the student with basic operations on files in the Unix environment.

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

S.No	Outcome	KL
1	**Develop** the algorithms, Programs and draw flowcharts for solving Mathematical and Engineering problems using basic elements like variables, operators and expressions.	K4
2	**Utilize** control statements, Functions to develop structured and unstructured programs and apply code reusability with user defined functions.	K3
3	**Develop** programs using arrays and pointers to implement static and dynamic memory allocation.	K4
4	**Design**, implement, test and debug programs that use Structures and I/O operations.	K4
5	**Develop** C programs for simple applications using files	K4

SYLLABUS

UNIT-I (8 Hrs)	**General problem-solving concepts**: Algorithm, and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops. **Imperative languages**: Introduction to imperative language; syntax and constructs of a specific language (ANSI C) **Types Operator and Expressions with discussion of variable naming and Hungarian Notation:** Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation.
UNIT-II (8 Hrs)	**Control Flow with discussion on structured and unstructured programming**: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, goto Labels, structured and unstructured programming. **Functions and Program Structure with discussion on standard library:** Basics of

	functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialization, Recursion, Preprocessor, Standard Library Functions and return types.
UNIT-III (8 Hrs)	**Pointers and Arrays:** Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi- dimensional array and Row/column major formats, Initialization of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.
UNIT-IV (8 Hrs)	**Structures**: Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self- referral Structures, Table look-up, Typedef, Unions, Bit-fields. **Input and Output**: Standard I/O, Formatted Output – printf, formatted Input – scanf, Variable length argument list.
UNIT-V (8 Hrs)	**File:** file access including FILE structure, fopen, stdin, stdout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions. **Unix system Interface**: File Descriptor, Low level I/O – read and write, Open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator. **Programming Method**: Debugging, Macro, User Defined Header, User Defined Library Function, make file utility.

Text Books:

1.	B. W. Kernighan and D. M. Ritchi, “The C Programming Language”, 2/e, Prentice Hall, 1988.
2.	B. Gottfried, “Programming in C”, Schaum Outline Series, 2/e, McGraw-Hill Education, 1996.

Reference Books:

1.	Herbert Schildt, “C: The Complete Reference”, 4/e, McGraw Hill, 2017.
2.	YashavantKanetkar, “Let Us C”, 15/e,BPB Publications, 2016.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS1102	**HS**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

BUSINESS COMMUNICATION & VALUE SCIENCE - I LAB

(For CSBS)

Course Objectives:

1.	To understand what life skills are and their importance in leading a happy and well-adjusted life
2.	To motivate students to look within and create a better version of self
3.	To introduce them to key concepts of values, life skills and business communication

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

S. No	Outcome	KL
1	Recognize the need for life skills and values	K2
2	Recognize own strengths and opportunities	K2
3	Apply the life skills to different situations	K3
4	Understand the basic tenets of communication	K2
5	Apply the basic communication practices in different types of communication	K3

SYLLABUS

Exercise-1	**Overview of LOL** (include activity on introducing self) **Class activity** – presentation on favorite cricket captain in IPL and the skills and values they demonstrate **Self-work with immersion** – interview a maid, watchman, sweeper, cab driver, beggar and narrate what you think are the values that drive them
Exercise-2	**Activity**: Write a newspaper report on an IPL match **Activity:** Record a conversation between a celebrity and an interviewer **Quiz Time, Self-awareness** – identity, body awareness, stress management
Exercise-3	**Essential Grammar – I:** Refresher on Parts of Speech – Listen to an audio clip and note down the different parts of speech followed by discussion Tenses: Applications of tenses in Functional Grammar – Take a quiz and then discuss **Sentence formation** (general & Technical), Common errors, Voices. Show sequence from film where a character uses wrong sentence structure (e.g. Zindagi Na MilegiDobara where the characters use 'the' before every word)
Exercise-4	**Communication Skills:** Overview of Communication Skills, Barriers of communication, Effective communication **Types of communication**- verbal and non – verbal – Role-play based learning **Importance of Questioning, Listening Skills:** Law of nature- Importance of listening skills, Difference between listening and hearing, Types of listening.
Exercise-5	**Expressing self**, connecting with emotions, visualizing and experiencing purpose **Activity:** Skit based on communication skills **Evaluation on Listening skills –** listen to recording and answer questions based on them
Exercise-6	**Email writing**: Formal and informal emails, activity **Verbal communication**: Pronunciation, clarity of speech

Exercies-7	**Vocabulary Enrichment:** Exposure to words from General Service List (GSL) by West, Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms, significant abbreviations formal business vocabulary – Read Economic Times, Reader's Digest, National Geographic and take part in a GD, using the words you learnt/liked from the articles. Group discussion using words learnt. **Practice:** Toastmaster style Table Topics speech with evaluation
Exercise-8	**Written Communication**: Summary writing, story writing **Build your CV** – start writing your comprehensive CV including every achievement in your life, no format, no page limit **Project:** Create a podcast on a topic that will interest college students **Life skill:** Stress management, working with rhythm and balance, colours, and teamwork
Exercise-9	**Understanding Life Skills:** Movie based learning – **Pursuit of Happiness.** What are the skills and values you can identify, what can you relate to? **Introduction to life skills:** What are the critical life skills
Exercise-10	**Life skill:** Community service – work with an NGO and make a presentation **Life skill: Join a trek –** Values to be learned: Leadership, teamwork, dealing with ambiguity, managing stress, motivating people, creativity, result orientation.

Text Books:	
1.	There are no prescribed texts for Semester 1

Reference Books:	
1	English vocabulary in use – Alan Mc'carthy and O'dell
2	APAART: Speak Well 1 (English language and communication)
3	APAART: Speak Well 2 (Soft Skills)
4	Business Communication – Dr. Saroj Hiremath

Web References:	
1	Train your mind to perform under pressure- Simon sinek https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform- under pressure-capture-your-flag/
2	Brilliant way one CEO rallied his team in the middle of layoffs https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people-beforenumbers.html
3	Will Smith's Top Ten rules for success https://www.youtube.com/watch?v=bBsT9omTeh0

Online Resources:	
1	https://www.coursera.org/learn/learning-how-to-learn
2	https://www.coursera.org/specializations/effective-business-communication

Code	Category	L	T	P	C	I.M	E.M	Exam
B20BS1109	**BS**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

FUNDAMENTALS OF PHYSICS LAB

(For CSBS)

Course Objectives:

1.	To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
2.	Communicate their ideas effectively, both orally and in writing; and function effectively in multidisciplinary teams.
3.	To give skills that can transfer critical thinking into problem solving methods, how to identify what data is important, how to collect that data and then draw conclusions from it.
4.	To learn the usage of electrical and optical systems for various measurements.

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

S. No	Outcome	KL
1.	Describe the various procedures and techniques for the experiments.	K2
2.	Develop design/problem solving skills, practical experience through laboratory assignments which provide opportunities for developing team in multidisciplinary environments.	K2
3	Recognize and describe to test the optical components using principles of interference, diffraction, laser & optical fiber parameters.	K3
4	Applytheanalyticaltechniquesandgraphicalanalysistotheexperimental data.	K3

LIST OF EXPERIMENTS

1	Magnetic field along the axis of current carrying coil – Stewart and Gee
2	Verification of laws of series and parallel combinations of resistances using Carey-foster's bridge
3	To Study the Characteristics of PN Junction diode.
4	To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
5	To determine the energy gap of a semiconductor.
6	Tocalculatewavelengthsofprominentlinesusingdiffractiongratingnormalincidence.
7	Determination of wave length of light by Newton's rings method
8	Determination of diameter of thin wire/thickness of paper piece using wedge method
9	Determination of Plank constant.
10	Determination of the frequency of the AC supply – AC Sonometer.

Reference Books:

1.	Ajoy Ghatak, Optics, 5/e, Tata McGraw Hill, 2012.
2.	Sears & Zemansky University Physics, Addison-Wesley.
3.	Jenkins and White, Fundamentals of Optics, 3/e, McGraw-Hill, 1957.

e-Resources:

1.	https://vlab.amrita.edu/

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CB1102	**BS**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

FUNDAMENTALS OF COMPUTER SCIENCE & PROGRAMMING LAB

(For CSBS)

Course Objectives:

1.	Introduce the student to algorithm development for problem solving
2.	Familiarize the student with the modular approach to program design
3.	Acquaint the student with various programming constructs in C language
4.	Enable the student to convert logic into C language code
5.	Familiarize the student with basic operations on files in the Unix environment.

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

S.No	Outcome	KL
1.	**Design** the algorithms and draw flowcharts for the given mathematical and engineering problems.	K4
2.	**Write** computer programs for the given algorithm	K4
3.	**Design** programs with the relevant control structure and parameter passing using functions and derived data types.	K4
4.	**Create** and use header files and C pre-processor directive as utility	K5
5.	**Use** Pattern searching and parsing strategies in problem solving	K3

LIST OF EXPERIMENTS

1.	Introducing Raptor tool for drawing flow charts for Problem Solving.	
2.	Structured code writing with:	
	a	Small but tricky codes
	b	Proper parameter passing
	c	Command line Arguments
	d	Variable parameter
	e	Pointer to functions
	f	User defined header
	g	Make file utility
	h	Multi file program and user defined libraries
	i	Interesting substring matching / searching programs
	j	Parsing related assignments

Reference Books:

1.	Herbert Schildt, “C: The Complete Reference”, 4/e, McGraw Hill, 2017.
2.	Yashavant Kanetkar, “Let Us C”, 15/e,BPB Publications, 2016.

Regulation: R20	I / IV - B.Tech. II - Semester								
COMPUTER SCIENCE & BUSINESS SYSTEM									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2020-21 admitted Batch onwards)									
Course Code	**Course Name**	**Category**	**Cr**	**L**	**T**	**P**	**Int. Marks**	**Ext. Marks**	**Total Marks**
B20 BS 1205	Linear Algebra	BS	3	3	0	0	30	70	100
B20 BS 1206	Statistical Methods	BS	3	3	0	0	30	70	100
* B20 EC 1201	Principles of Electronics Engineering	ES	3	2	0	0	30	70	100
				0	0	2	15	35	50
B20 CB 1201	Data Structures and Algorithms	ES	3	3	0	0	30	70	100
B20 HS 1201	Fundamentals of Economics	HS	3	3	0	0	30	70	100
B20 BS 1209	Statistical Methods Lab	BS	1.5	0	0	3	15	35	50
B20 CB 1202	Data Structures and Algorithms Lab	EC	1.5	0	0	3	15	35	50
B20 HS 1203	Business Communication & Value Science – II	HS	1.5	0	0	3	15	35	50
B20 MC 1201	Environmental Science	MC	0	2	0	0	--	--	--
B20 MC 1203	National Service Scheme (NSS)	MC	0	0	0	2	--	--	--
		TOTAL	**19.5**	**16**	**0**	**13**	**210**	**490**	**700**

Note: *- Integrated course and its evaluation guide lines are mentioned in the Syllabus

Code	Category	L	T	P	C	I.M	E.M	Exam
B20BS1205	**BS**	**3**	**1**	**--**	**4**	**30**	**70**	**3 Hrs.**

LINEAR ALGEBRA

(For CSBS)

Course Objectives: Students are expected to learn

1	Concepts of linear algebra and methods of solution of linear simultaneous algebraicequations.
2	LU Decomposition method and Solving Systems of Linear Equations.
3	Dimension, Basis, Orthogonality and Projectionsin Vector spaces
4	Gram-Schmidt orthogonalization and QR decomposition Methods
5	Eigen values, Eigen vectors and Linear Transformations
6	Singular value decomposition and Principal component analysis

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

S.No	Outcome	Knowledge Level
1	Apply knowledge of basics of Matrices, Determinants and to test for consistency and solve systems of equation	K3
2	Determine Rank of Matrix and apply LU Decomposition Method	K3
3	Describe Vector Space, Orthogonality and Projection.	K3
4	Apply Gram-Schmidt orthogonalization and QR decomposition methods	K3
5	Calculate Eigen values and Eigen Vectors and Linear Transformations	K3
6	Describe Singular value decomposition and Principal component analysis with certain applications	K3

SYLLABUS

UNIT-I (10 Hrs)	Introduction to Matrices, Determinants, Solution of Linear Equations by Triangle method, Cramer's rule and Gaussian elimination; Inverse of a Matrix by Gauss – Jorda n method.
UNIT-II (12Hrs)	Vectors and linear combinations; Rank of a matrix by Gaussian elimination; Solving Systems of Linear Equations using LU Decomposition andGauss Seidel methods
UNIT-III (12Hrs)	Vector space; Dimension; Basis; Orthogonality; Projections; Gram-Schmidt Orthogonalization and QR decomposition.
UNIT-IV (12Hrs)	Eigen Values and Eigen Vectors; Linear transformations: vector space of L.T., properties of Linear operator, Rank and Nullity of L.T.; Hermitian and unitary matrices.
UNIT-V (10Hrs)	Singular value decomposition and Principal component analysis; Introduction to their applications in Image Processing and Machine Learning.

Text Books:

1.	Advanced Engineering Mathematics, Erwin Kreyszig,John Wiley & Sons, 10th Edition
2.	Introduction to linear algebra, (Fifth Edition), Gilbert Strang, Wellesley-Cambridge Press.

3.	Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers.
Reference Books:	
1.	Advanced Engineering Mathematics, (Second Edition), Michael. D. Greenberg, Pearson.
2	Advanced Engineering Mathematics, (Seventh Edition), Peter V. O'Neil, Cengage Learning.
3	Linear Algebra, M. L. Kanna, Jai Prakash nath& Co, Meerut
4.	Applied Mathematics (Vol. I & II), P. N. Wartikar& J. N. Wartikar, Pune Vidyarthi GrihaPrakashan.
5.	Digital Image Processing, R C Gonzalez and R E Woods, Pearson.
6.	Linear Algebraand Optimizationfor MachineLearning, Charu C. Aggarwal, Springer Publication

Code	Category	L	T	P	C	I.M	E.M	Exam
B20BS1206	**BS**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

STATISTICAL METHODS

(For CSBS)

Course Objectives: Students are expected to

1	Get familiarized to different Correlation and linear regression methods.
2	Learn various sampling techniques and to find the sampling distribution to the given sample data.
3	Know how to fit best curve using method of least squares to the given data by various curve fitting models.
4	Learn the concept of estimation and get familiar with the use of maximum likelihood estimation method
5	Know how to design and conduct experiments by ANOVA and forecast the data by various models in time series.
6	Learn how to test the hypothesis for non parametric data.

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

S.No	Outcome	K L
1	Apply different Correlation and linear regression methods.	K3
2	Illustrate sampling techniques and generate a sampling distribution to the given sample data.	K3
3	Understand the concept of Method of least squares and apply it to fit various types of curves.	K3
4	Make use of the concepts of estimation and predict the maximum likelihood estimate from the given model.	K3
5	Apply ANOVA techniques and forecasting methods to the given time series data.	K3
6	Make use of testing of hypothesis and its applications to the non-parametric data.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Linear Statistical Models:** Scatter diagram. Correlation, Types of correlation, correlation coefficient, properties of correlation coefficient (without proofs), Rank correlation, Linear regression, Multiple regression & multiple correlation.
UNIT-II (10 Hrs)	**Sampling Techniques:** Types of sampling- Random sampling. Sampling from finite and infinite populations. Parameter, statistic, sampling distribution and standard error (sampling with replacement and sampling without replacement), Sampling distribution of sample mean (σ known) and variance. Sampling distribution of differences and sums.
UNIT-III (12 Hrs)	**Curve fitting by Least squares method**-Fitting of straight line, second degree polynomial, power and exponential curves. **Estimation:** Point estimation, criteria for good estimates (un-biasedness, consistency), Interval estimation, Methods of estimation - maximum likelihood estimation. Sufficient Statistic: Concept & examples, complete sufficiency, their application in

	estimation.
UNIT-IV (12 Hrs)	**ANOVA:** Analysis of Variance (one-way classification), Analysis of Variance (two-way classification). **Basics of Time Series Analysis & Forecasting:** Stationary, ARIMA Models: Identification, Estimation and Forecasting.
UNIT-V (12 Hrs)	**Test of hypothesis:** Concept & formulation, Type I and Type II errors, Neyman Pearson lemma (without proof), Procedures of testing of hypothesis. **Non-parametric Inference:** Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman's and Kendall's test. Tolerance region.

Text Books:	
1.	Probability & Statistics for Engineers & Scientists, Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, 9th Edition, Prentice Hall
2.	Probability and Statistics for Engineers (Fourth Edition), I.R. Miller, J.E. Freund and R. Johnson, Prentice Hall India Learning Private Limited.
3.	Fundamentals of Mathematical Statistics by S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons Publishers.
Reference Books:	
1.	Introduction to Time Series Analysis and Forecasting, Douglas C. Montgomery, Cheryl L. Jennings, Murat Kulahci, Wiley Publications, 2011A.
2.	Fundamentals of Statistics, Goon, M. Gupta and B. Dasgupta, vol. I & II, 1/e, World Press,2013.
3.	Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 10th Edition
4.	Introduction of Probability Models, S.M. Ross, 10/e, Academic Press, N.Y,2010.
5.	Higher engineering mathematics, B V Ramana, MC Graw Hill Education publications.
Data Sources:	
1.	www.rbi.org.in

Code	Category	L	T	P	C	I.M	E.M	Exam
B20EC1201	ES	2	--	2	3	Theory: 30	Theory: 70	Theory: 3 Hrs.
						Lab:15	Lab:35	Lab: 3 Hrs.

PRINCIPLES OF ELECTRONICS ENGINEERING

(For CSBS)

Course Objectives: Students are expected to learn

The fundamental concepts, operation & applications in both theoretical and practical approach of Analog electronic devices & circuits and also the basics of Digital electronic circuit elements.

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

S.No	Outcome	K L
1	Understand the basics of semiconductors with respect to current carrying capability and the operation of diode, diode circuits and rectifiers and practically study and analyze characteristics of PN junction diode, Zener diode and rectifier circuits.	K3
2	Explain the structure & operation of BJT, JFET and MOSFET devices as well as amplifier circuits and analyze characteristics of BJT and FET amplifiers practically.	K3
3	Understand the principles of feedback, its advantages & disadvantages and Explain the properties &practically understand the applications of an operational amplifier.	K3
4	Explain the difference between analog and digital signals and implement basic digital system operations at component level by designing combinational and sequential logic circuits and test their operations.	K4

SYLLABUS (Theory)

UNIT-I (8 Hrs)	**Semiconductors:** Electrical properties, Energy band theory of solids, Fermi levels, Properties & energy band diagrams of Conductors, Semiconductors & insulators, Intrinsic & extrinsic semiconductors, P-type and N-type semiconductors, Mobility and conductivity, Dependence of conductivity on temperature, Drift & diffusion currents and their densities.
UNIT-II (8 Hrs)	**Diodes**: Formation of P-N junction & depletion zone, Energy band diagram, Built-in-potential, Forward and reverse biased P-N junction, V-I characteristics, Zener diode and its reverse characteristics. **Diode Circuits**: Half-wave & Full-wave Bridge Rectifiers, PIV, DC voltage and current, Ripple factor, Efficiency &Zener diode as a voltage regulator.
UNIT-III (8 Hrs)	**Bipolar Junction Transistor (Simple theory only):** BJT introduction, Principle of construction & operation, PNP & NPN transistors, Basic transistor action, CE, CB, CC configurations, Input and Output characteristics, Active, cut-off and saturation modes of operation, Transistor Biasing: Fixed bias & Self bias, Transistor as an Amplifier & Switch. **Field Effect Transistors (Simple theory only):** JFET structure & operation, Characteristics and parameters, MOSFETs, Depletion and Enhancement types, Basic Principles of CMOS, FET advantages & applications.
UNIT-IV (8 Hrs)	**Principles of Feedback Amplifiers, Oscillators and Operational Amplifiers (Simple theory, concepts & block diagram description only):** Feedback concept, Advantages,

	Positive and negative feedback, Loop gain, Feedback factor, Topologies of feedback amplifier, Effect of negative feedback on gain, Effect of positive feedback: Instability and oscillation, Condition of oscillation, Barkhausen criteria. Introduction to integrated circuits, Operational amplifier (OPAMP) parameters & terminal properties, OP-AMP Applications: Inverting and non-inverting Amplifiers, Difference amplifier, Adders &subtractors, Comparator, Integrator, Differentiator, OP-AMP RC phase shift oscillator
UNIT-V (8 Hrs)	**Digital Electronics Fundamentals**: Difference between analog and digital signals, Number systems: Binary, Decimal, Octal, Hexa-decimal and conversions, Logic gates & ICs, Half & Full adder/subtractor, 2x1 & 4x1 Multiplexers, Demultiplexer, Flip-flops: SR, T, D flip-flops, Simple shift registers & counters.

SYLLABUS (Laboratory) (Hardware & Simulation Expts: 2+4)	
1	V-I characteristics of a P-N junction (or Zener) diode
2	Half wave Rectifier operation and parameter calculation.
3	BJT (JFET) Characteristics in CE (CS) configuration
4	OP-AMP Applications: Inverting & Non-inverting amplifiers
5	OP-AMP Applications: Square wave generator (or RC phase shift oscillator)
6	Verification of basic Logic gates operation
7	Verification of Half/Full Adder and Half subtractor
8	Verification of Flip-flops operation
9	Verification of Shift register (or Counter) operation
10	Design & verification of a Binary to Gray code converter

Text Books:	
1.	Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky.
2.	Electronic Principles, Albert Paul Malvino.
3.	Digital Logic & Computer Design, M. Morris Mano, Pearson

Reference Books:	
1.	Microelectronics Circuits, Adel S.Sedra and Kenneth Carless Smith, Oxford University Press
2.	Millmans's Integrated Electronics, Jacob Milliman, Christos Halkias, Chetan Parikh, McGRaw Hill Education.
3.	Electronics Circuits: Discrete & Integrated, D Schilling C Belove T Apelewicz R Saccardi.
4.	Microelectronics, Jacob Milliman, Arvin Grabel.
5.	Solid State Electronic Devices, 6th Edition, Ben Streetman, Sanjay Banerjee
6.	Electronics Devices & Circuits, S. Salivahanan, N. Suresh Kumar, A. Vallavaraj

Evaluation guidelines for the integrated course:

The Student has to pass both theory and lab examinations separately in order to complete the Integrated Course. If the Student fails in either theory or lab, he/she has to reappear for both theory and lab in supplementary examinations. Student will be declared as pass only when he/she completes both theory and lab at the same time.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CB1201	**ES**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

DATA STRUCTURES AND ALGORITHMS

(For CSBS)

Course Objectives: The student who successfully completes this course will have:

1	The understanding of different parameters to analyze the performance of algorithms
2	The understanding of linear data structures such as stack, queue and their applications.
3	The understanding of non-linear data structures such as trees, graphs and their applications.
4	The familiarity with various sorting, searching and hashing techniques and their performance comparison.

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

S. No	Outcome	KL
1	**Identify** different parameters to analyse the performance of algorithms and implement linear data structures.	K3
2	**Design** algorithms to perform operations with Non Linear data structures.	K4
3	**Illustrate** different techniques for searching and sorting for given data.	K3
4	**Understand** the concepts of files and **implement** accessing schemes on data structure.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Basic Terminologies and Introduction to Algorithm & Data Organization**: Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction
UNIT-II (10 Hrs)	**Linear Data Structure:** Array, Stack, Queue, Linked-list and its types, Various Representations, Operations & Applications of Linear Data Structures
UNIT-III (12 Hrs)	**Non-linear Data Structure:** Trees (Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, Splay Tree) and Graphs (Directed, Undirected), Various Representations, Operations & Applications of Non-Linear Data Structures.
UNIT-IV (12 Hrs)	**Searching and Sorting on Various Data Structures:** Sequential Search, Binary Search, Comparison Trees, Breadth First Search, Depth First Search Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heap sort, Introduction to Hashing
UNIT-V (12 Hrs)	**File**: Organization (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessing schemes. **Graph:** Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Text Books:	
1.	Fundamentals of Data Structures, E. Horowitz, S. Sahni,S. A-Freed, Universities Press.
2.	Data Structures and Algorithms, A. V. Aho, J. E. Hopperoft, J. D.UIlman, Pearson.
Reference Books:	
1.	The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth.
2.	Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, The MIT Press.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS1201	**HS**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

FUNDAMENTALS OF ECONOMICS

(For CSBS)

Course Objectives: The objective of this course is to introduce the fundamental concepts in Economics and make the Students familiarize about the concepts of Micro Economics and Macro Economics.

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

S.No	Outcome	KL
1	Understand the definitions of Economics and the classification of Economics.	K2
2	Prepare Schedules of Demand, Supply and able to predict Demand.	K3
3	Explain the importance of Welfare Analysis and Utility Analysis.	K2
4	Describe the Production theory, Cost Analysis and Market Structures.	K2
5	Analyse the role of Government in the economy and identify Government policies.	K3
6	Discuss the impact of Macro Economics on the economy.	K2

SYLLABUS

UNIT-I (8 Hrs)	**Nature of Economics**: Definitions of Economics- Wealth, Welfare and Scarcity; Classification of subject matter of Economics- Micro and Macro Economics. **Demand Analysis :** Definition, Law of Demand and its limitations; Demand Schedule, Demand Curve; Elasticity of Demand - Definition: Types of Elasticity and their practical importance. **Demand Forecasting:** Types, Objectives and Purpose of Forecasting; Methods of demand Forecasting: Survey and Opinion methods; Forecasting demand for new products. **Supply Analysis:** Meaning of Supply, Law of Supply and Supply function; Factors influencing change in Supply.
UNIT-II (8 Hrs)	**Welfare Analysis**: Definition of Welfare Economics, deference between positive economics and welfare economics. **Utility Analysis**: Meaning, Law of Diminishing Marginal Utility and its assumptions, exceptions and importance. **Indifference Curve Analysis:** Assumptions, Schedule and Map, Properties or Characteristics of Indifference Curves; Uses, importance and application value of Indifference Curves.
UNIT-III (8 Hrs)	**Theory of Production**: Meaning of production, Assumptions of Production Function– Use of production function in decision making. **Cost Analysis:** Fixed Cost, Variable Cost, Marginal Cost, Average Cost, Short Run Cost, Long Run Cost; Cost-Output relationship in Short Run and Long Run. **Market Structures:** Classification of Markets; Salient Features of Perfect Competition, Monopoly, Duopoly, Oligopoly and Monopolistic Competition.

UNIT-IV (8 Hrs)	**Macro Economics:** Definitions of National Income; Concepts of National Income GNP, NNP, NI,PI, DI; Measurement of National Income -Production method, Income method and expenditure method. **Public Finance:** Public Revenue-Taxes, Classification of taxes; Public expenditure-Importance and causes of increase in public expenditure. **Inflation**-Definition, Causes, Control of inflation- Monetary, Fiscal and non-monetary measures.
UNIT-V (8 Hrs)	**Money** – Definitions, Functions of money; Essentials of good money, demand for money and supply of money. **Trade Cycles-** Meaning of Trade cycles, Phases of a trade cycle, The Cobweb theory of Trade cycle , Remedial Measures of trade cycles- Monetary and Fiscal Policies.

Text Books:	
1.	Microeconomics , Pindyck,Robert S., and Daniel L.Rubinfeld
2.	Macroeconomics,Dornbusch,Fischer and Startz
3.	Economics,Paul Anthony Samuelson,William D.Nordhaus
4.	Modern Economic Theory, K Dewett, S. Chand & Company Ltd., New Delhi.
5.	Managerial Economics, Dr. S. Sankaran,Margham Publications, Chennai.
Reference Books:	
1.	Intermediate Microeconomics : A Modern Approach , Hal R,Varian
2.	Principles of Macroeconomics, N.Gregory Mankiw

Code	Category	L	T	P	C	I.M	E.M	Exam
B20BS1209	**BS**	**--**	**--**	**3**	**1.5**	**40**	**60**	**3 Hrs.**

STATISTICAL METHODS LAB

(For CSBS)

Course Objectives: The student who successfully completes this course will have

1.	The knowledge to use R for statistical programming, computation, modelling and graphics.
2.	The skill to write functions and use R in an efficient way.
3.	The ability to fit some basic types of statistical models using R.
4.	The idea to expand the knowledge of R on their own.

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

		KL
1.	Write the programs in R to solve the statistical problems.	K3
2.	Apply various built in functions in R to solve the computational and modelling problems.	K3
3.	Interpret the statistical data by various functions of graphical representation	K4
4.	Understand- reading, writing, working and manipulating the data in various data frames.	K3

LIST OF PROGRAMS

R statistical programming language:

1	Introduction to R
2	Functions
3	Control flow and Loops
4	Working with Vectors and Matrices
5	Reading in Data
6	Writing Data
7	Working with Data
8	Manipulating Data
9	Simulation
10	Linear model
11	Data Frame
12	Graphics in R

Reference Books:

1.	Introduction to Time Series Analysis and Forecasting, Douglas C. Montgomery, Cheryl L. Jennings, Murat Kulahci, Wiley Publications, 2011A.
2.	Fundamentals of Statistics, Goon, M. Gupta and B. Dasgupta, vol. I & II, 1/e, World Press,2013.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CB1202	**ES**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

DATA STRUCTURES AND ALGORITHMS LAB

(For CSBS)

Course Objectives: The student who successfully completes this course will have:

1	Be familiar with basic techniques of algorithm analysis and apply the suitable data structure for the given real world problem.
2	Master the implementation of simple linear and nonlinear data structures.
3	Be familiar with several searching and sorting algorithms.
4	It enables them to gain knowledge in practical applications of data structures.

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

S. No	Outcome	KL
1	Design and analyze the time and space efficiency of the data structure.	K4
2	Identity the appropriate data structure for given problem.	K3
3	Have practical knowledge on the applications of data structures.	K4
4	Have practical knowledge on handling data structures with files.	K4

SYLLABUS

Data Structures And Algorithms Lab using C programming language:

1	Sorting a list using Bubble sort and then apply binary search.
2	Implement quick sort algorithm.
3	Implement the operations on stacks using Array
4	Towers of Hanoi using user defined stacks.
5	Implement the operations on queues using Array.
6	Implement the operations on circular queues using Arrays.
7	Implement the Single Linked List operations (Insertion, Deletion).
8	Reading, writing, and addition of polynomials.
9	Implement the Circular Single Linked List operations (Insertion, Deletion).
10	Implement the Double Linked List operations (Insertion, Deletion).
11	Create a binary search tree and for implementing the inorder, preorder, postorder traversal using recursion.
12	Finding the Depth First Search of a graph, and Breadth First Search of a graph
13	Finding the transitive closure of a digraph
14	Line editors with line count, word count showing on the screen.
15	Finding the shortest paths from a given source to any vertex in a digraph using Dijkstra's algorithm.
16	Saving / retrieving non-linear data structure in/from a file

Reference Books:

1.	The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth.
2.	Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Cliford Stein, The MIT Press.

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS1203	**HS**	**--**	**--**	**3**	**1.5**	**15**	**35**	**3 Hrs.**

BUSINESS COMMUNICATION & VALUE SCIENCE - II

(For CSBS)

Course Objectives:

1.	To develop effective writing, reading, presentation and group discussion skills.
2.	To help students identify personality traits and evolve as a better team player.
3.	To introduce them to key concepts of: Morality, Behavior and beliefs, Diversity & Inclusion

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

S. No	Outcome	KL
1	Understand and use tools of structured written communication	K3
2	Understand the basics of presentation and apply efficacious techniques to make presentations in the electronic/social media to share concepts and ideas required for any organization.	K3
3	Design various activities of communication resulting in building a team-spirit and creating social awareness.	K3
4	Understand the basic concepts of Morality and Diversity	K2
5	Create communication material to share concepts and ideas	K4

SYLLABUS

Exercise-1	Icebreaker. 1) Participate in 'Join Hands Movement'. Individual identification of social issues.2) Each Individual chooses one particular social issue which they would like to address. 3) Class to be divided in teams for the entire semester. All activities to be done in teams and the grades, credit points will be captured in the leader board in the class room.4) Theory to introduce the participant Slam book to be used for capturing individual learning points and observations. Research on the social cause each group will work for. Class discussion- Good and Bad Writing. Common errors, punctuation rules, use of words. **Group Practical** – As a group, they will work on the social issue identified by them. Research, read and generate a report based on the findings.(Apply the learning and recap from the session) **Practical:** Plan and design an E Magazine. Apply and assimilate the knowledge gathered from Sem-1 till date. Share objective & guideline. All members to contribute an article to the magazine, trainer to evaluate the content.
Exercise-2	Lucid Writing: Encourage the students to go through the links given about Catherine Morris and Joanie Mcmahon's writing techniques. Create the magazine, SATORI – Participants share the personal take away acquired from GD, writing and reading skills activities captured in their handbook. Share the most important learning points from the activities done so far and how that learning has brought a change. Launching an E Magazine.
Exercise-3	Each group will form an NGO. Create Vision, Mission, Value statement, tagline and Design a logo.

	Introduction to basic presentation skills& ORAI app Groups to present their NGOs. Apply the learning gathered from session 2. Presentation to be recorded by the groups. feedback from the audience/ Professor Group to come back and share their findings from the recording. Post work- individual write up to be written and evaluated for the E- magazine Prepare and publish the Second episode of the E Magazine.
Exercise-4	Speed Reading session: Introduction to skimming and scanning; practice the same. SATORI – Join the dots- Participants to connect their learning gathered from AIP Unit-2 with their existing curriculum **Quiz Time**
Exercise-5	Ad campaign- Brain storming session- Students to discuss and explore the means of articulating and amplifying the social issue their NGOs are working for. Design a skit- a) write the script articulating the message of their respective NGOs. Read out the script. (Skit time-5 minutes). Feedback of Theory. Promote the play through a social media and gather your audience. Enact the play. Capture the numbers of likes and reviews. Theory to assign grades to individual team. (1)Theory to find out from the participants their views, observations and experiences of working in a team (2) Intro of Dr. Meredith Belbin and his research on team work and how individuals contribute. (3) Belbin's 8 Team Roles and Lindgren's Big 5 personality traits. (4) Belbin's 8 team player styles
Exercise-6	(1)Team Falcon Practical to identify individual personality traits with Belbin's 8 team player styles (2) Similar personality types to form groups (3) Groups present their traits. Prepare and publish the third episode of the E Magazine. SATORI – (join the dots with participants personal life) Participants share the personal take away acquired from working in teams, GD, learning about presentations, presenting their NGOs
Exercise-7	Ten minutes of your time – a short film on diversity. Play the video (link to be attached in the FG) Discuss key take away of the film. Theory to connect the key take away of the film to the concept of empathy. Touch the target (Blind man) - Debriefing of the Practical.
Exercise-8	Film: “The fish and I’’ by BabakHabibifar” (1.37mins) Groups to create a story – 10 minutes of a person's life affected by the social issue groups are working on. Narrate the story in first person. Feedbacks to be shared by the other groups.
Exercise-9	Research on a book, incident or film based on the topic of your respective NGO Write a review in a blog on the topics they are covering in their research. Theory will give grades to each team. Teams to video record interviews of people from diverse groups (Ask 5 questions). Share the recordings in FB

Exercise-10	Debate on the topic of diversity with an angle of ethics, morality and respect for individual (In the presence of an external moderator). Groups will be graded by the professor. Prepared speech- Every student will narrate the challenges faced by a member of a diverse group in 4 minutes (speech in first person). Theory to give feedback to each student.
Exercise-11	Discussion on TCS values, Respect for Individual and Integrity. Prepare and publish the final episode of the E Magazine. SATORI –Participants share the personal take away acquired from working in teams, GD, learning about presentations and understanding diversity inclusion. **Revisit your resume** Include your recent achievements in your resume.
Exercise-12	**Project-**1) Each team to look for an NGO/ social group in the city which is working on the issue their college group is supporting. 2) Spend **a day with the NGO/ social group** to understand exactly how they work and the challenges they face. 3) Render voluntary service to the group for one day 4) Invite the NGO/ social group to address their university students for couple of hours. Plan the entire event, decide a suitable venue in the university, gather audience, invite faculty members etc. (they need to get their plan ratified their professor). Outcome-- Host an interactive session with the NGO spokesperson 5) The groups to present their experience of **a day with the NGO** and inspire students to work for the cause.
Text Books:	
1.	There are no prescribed texts for Semester 2 – there will be handouts and reference
Reference Books:	
1	Guiding Souls: Dialogues on the purpose of life; Dr. A.P.J Abdul Kalam; Publishing Year-2005; Co-author--Arun Tiwari
2	The Family and the Nation; Dr. A.P.J Abdul Kalam; Publishing year: 2015; Co-author: Acharya Mahapragya
3	The Scientific India: A twenty First Century Guide to the World around Us; Dr. A.P.JAbdul Kalam; Publishing year: 2011; Co-author- Y.S.Rajan
4	Forge Your Future: Candid, Forthright, Inspiring ; Dr. A.P.J Abdul Kalam; year: 2014
5	Abundance: The Future is Better Than You Think; Peter H. Diamandis and Steven Kotler; Published: 21 Feb, 2012; Publisher: Free Press
6	Start With Why: How Great Leaders Inspire Everyone to Take Action; Simon Sinek; Published: 6 October 2011; Publisher: Penguin B.E. /B.Tech in Computer Science & Business Systems Semester 2
7	Advertising & IMC: Principles and Practice; Sandra Moriarty, Nancy D. Mitchell, William, D. Wells; Published: 15 June 2016; Publisher: Pearson Education India

Code	Category	L	T	P	C	I.M	E.M	Exam
B20MC1201	MC	2	--	--	0	--	--	--

ENVIRONMENTAL SCIENCE

Common to AIDS,CE,CSBS,EEE & ME

Course Objectives: The objectives of the course are to impart:

1.	Overall understanding of the natural resources.
2.	Basic understanding of the ecosystem and its diversity.
3.	Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
4.	An understanding of the environmental impact of developmental activities.
5.	Awareness on the social issues, environmental legislation and global treaties.

Course outcomes : After completion of the course, students will be able to		**K L**
1	Bring awareness among the students about the nature and natural ecosystems	K2
2	Sustainable utilization of natural resources like water, land, energy and air	K4
3	Resource pollution and over exploitation of land, water, air and catastrophic (events) impacts of climate change, global warming, ozone layer depletion, marine, radioactive pollution etc to inculcate the students about environmental awareness and safe transfer of our mother earth and its natural resources to the next generation	K5
4	Constitutional provisions for the protection of natural resources	K2
5	Green technologies and its applications	K3

SYLLABUS

UNIT-I (8 Hrs)	**Multidisciplinary nature of Environmental Studies:** Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects;. Role of information technology in environment and human health. **Ecosystems:** Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.
UNIT-II (8 Hrs)	**Natural Resources: Natural resources and associated problems.** Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people. Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources**:** World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

	Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.
UNIT-III (8 Hrs)	**Biodiversity and its conservation:** Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation ofbiodiversity.
UNIT-IV (8 Hrs)	**Environmental Pollution:** Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being. **Solid Waste Management:** Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.
UNIT-V (8 Hrs)	**Social Issues and the Environment:** Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Sustainability: theory and practice, Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation.-Public awareness.
UNIT-VI (8 Hrs)	**Environmental Management**: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Greenpolitics. Environmental dairy. **The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.**

Text Books:	
1.	Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers,Vijayawada Rani; Pearson Education, Chennai
2.	Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford UniversityPress.
3.	Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, andK.Manjula

Reference Books:	
1.	Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, CengageLearning.
2.	A Textbook of Environmental Studies, Shaashi Chawla, TMH, NewDelhi
3.	Environmental Studies, Benny Joseph, Tata McGraw Hill Co, NewDelhi
4.	Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New AgeInternational Publishers,2014

Code	Category	L	T	P	C	I.M	E.M	Exam
B20MC1203	**MC**	**--**	**--**	**2**	**--**	**--**	**--**	**--**

NATIONAL SERVICE SCHEME(NSS)

(Common to All Branches)

Course Objectives:

1.	To understand the community and understand themselves in relation to their community.
2.	Identify the needs and problems of the community and involve them in problem solving process.
3.	Utilize their knowledge for finding practical solution to individual and community problems.

Course Outcomes: Student will be able to

S.No		Knowledge Level
1.	**understand** general orientation about community service, voluntarism role and responsibility of NSS volunteer.	K2
2.	**Analyze** about the community he live in.	K4
3.	**Asses** the life in adopted villages.	K5
4.	**Identify** the importance of national days and attain participation in it.	K3

SYLLABUS

1.	Volunteerism- community and beyond(Theory).
2.	Role and responsibility of NSS volunteer (Theory).
3.	General orientation about community service(Theory).
4.	Arranging lectures on social issues in schools or villages(Theory).
5.	Arranging rally's on social issues.
6.	Socio economic survey in adopted villages
7.	Plantation of saplings.
8.	Blood donation camp
9.	Rainwater harvesting awareness camp.
10.	Celebration of national days as per NSS list.