DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

VNIT, NAGPUR

Name of UG Program: B.Tech. in CSE

Table 1: Structure for B.Tech in CSE

Sr. No.	Category of Course	Symbol	Earned Credit Requirement
1	Basic Sciences	BS	12
2	Engineering Sciences	ES	12
3	Humanities	HU	03
4	Institute Core	IC	02
5	Departmental Core	DC	78
6	Mandatory Non-Credit	MNC	At least 4 courses
7	Institute Elective	IE	6-12
8	Departmental Elective	DE	Min 42
9 & 10	Humanities and Management and Open Course	HM/OC	0-6

Note: OC/HM/IE should be within the range 6-12

1st Semester

Table 2: 1st Semester B.Tech in CSE

Sr. No.	Course Code (Ex.: EEE3xx)	Course Title	L–T– P	Credits	Course Type	Pre-requisites
Program Core						
1.	PHL102	Physics	3-0-0	3	BS	
2.	PHP102	Physics	0-0-2	1	BS	
3.	CSL101	Computer Programming	3-0-2	4	ES	
4.	EEL103	Electrical Engineering	3-0-0	3	ES	
5.	EEP103	Electrical Engineering	0-0-2	1	ES	
6.	MAL101	Mathematics I	3-1-0	4	BS	
7.	ICL1xx	Environmental Studies	2-0-0	2	IC	
8.	HUL1xx	English and Corporate Communication	2-0-2	3	HU	
9.	SAA101	Health Information and Sports - Part 1		0	MNC	
Program Elective						
10.		–				

Credits	BS	ES	HU	DC	IC	IE/DE/HM/OC	Total
1st Sem	8	8	3	0	2	0	21
Cumulative	8	8	3	0	2	0	21

2nd Semester

Table 3: 2nd Semester B.Tech in CSE

Sr. No.	Course Code (Ex.: EEE3xx)	Course Title	L–T–P	Credits	Course Type	Pre-requisites
Program Core						
1.	ECLxxx	Basics of Electronics Engineering	3-0-2	4	ES	
2.	MAL102	Mathematics II	3-1-0	4	BS	
3.	CSL213	Data Structures and Program Design - I	3-1-2	5	DC	CSL101: CP
4.	CSL226	Digital Circuits and Microprocessors	3-0-2	4	DC	None
5.	CSP201	Software Lab I	0-1-2	2	DC	None
6.	SAA102	Health information and Sports - Part 2		0	MNC	
Program Elective						
	IE/OC/HM					
	Minor/Honor					

Credits	BS	ES	HU	DC	IC	IE/DE/HM/OC	Total
2nd Sem	4	4	0	11	0	0-6	19-25
Cumulative	12	12	3	11	2	0-6	40-46

Syllabus of 1st semester B. Tech. in CSE (160 Credits)

PHL102: Physics

Course Code & Course Title:	**PHL102 Physics**		
Course Type:	**BS**		
Name of the programme(s):	**B Tech**		
L – T – P	**3-0-0**	**No. of Credits**	**3**
Pre-requisites: Course Code(s) & Name(s)	**Nil**		
Course Equivalence: Course Code(s) & Name(s)			

1.	**Course Objective:** 1. To provide a strong foundation in physics in preparation for technical or scientific career. 2. To develop skills that enables to function as productive, qualified engineering professionals in areas where traditional science and engineering disciplines overlap. 3. Create awareness about the importance of continued professional development.

2.	**Course Outcomes (Min. 3 & Max. 5):** Student will be able to:
CO1	Understand the concepts of quantum mechanics and its application
CO2	Comprehend the primitive crystal systems through packing density and Miller indices.
CO3	Develop an understanding for basics of semiconductors based on band theory applied to electronic devices
CO5	Learn the basics of LASERs and its applications in optical fibers

3.	**Detailed Description of the Course**		
	Topics	**CO(s) Addressed**	**Duration in weeks**
	Quantum Mechanics: Origin of quantum mechanics, Compton effect, Concept of matter waves, Davission and Germer's experiment, Heisenberg's Uncertainty principle, Schrodinger's Wave equation and its application and Quantization of energy. (7)	CO1	2

Applications of Quantum Mechanics: Particle in 1,2 and 3 dimensional infinite potential well, Quantization of energy, Operators, Eigen states and Eigen values, Introduction to quantum computing (6)	CO1	3
Elementary crystal structure: Unit cell and its characteristics in SC, BCC, FCC crystal structure, Miller indices, Bragg's Law, inter-planer spacing. (4)	CO2	2
Semiconductor Physics: Formation of energy bands in solid, classification of solids: intrinsic and extrinsic semiconductor, Fermi level in an intrinsic and extrinsic semiconductor, Hall effect (9)	CO3	2
Device Physics: V-I characteristics of p-n junction diode, zener diode, photo diode, LED, BJT, FET and MOSFET. (8)	CO3	2
LASER Optics: Introduction to LASER, Spontaneous and Stimulated Emission, Different types of CW & Pulse lasers & their characteristics, Principle & characteristics of optical fibers, Different types of optical fibers (8)	CO4	2

4.	**Text books** i) M N Avadhanulu, P. Kshirsagar, A Textbook of Engineering Physics, 2017, S Chand Publications ISBN 13: 9789352833993

5.	**Reference Book(s) and Other Required Material** i) A.J. Dekker, Solid State Physics, MacMillan, Student Edition (2000) ISBN-13. 9780333918333 ii) B.B. Laud, Lasers and nonlinear optics, New Age International limited (1991). ISBN-13. 978-9393159670. iii) B. G. Streetman, Solid State Electronics, Prentice Hall India (2^{nd} Edition) (1986) ISBN-13. 978-0134363790 iv) B. E. Conway Electrochemical Supercapacitors Scientific Fundamentals and Technological Applications 2013 Springer US ISBN : 9781475730586 v) David J. Griffiths, Introduction to Quantum Mechanics, Cambridge India (2016) ISBN-13. 978-1107179868 vi) Kenneth Krane; Modern Physics, John Wiley Eastern (2^{nd} Edition); (1998) ISBN-13, 978-0471828723 vii) Resnick, Walker and Halliday, Fundamental of Physics, John Willey and Sons. Inc, 6^{th} Edition (2005). ISBN · 9788126508235 viii) S.M. Sze Semiconductor devices (Physics and Technology), II Edition, Wiley India Pvt. Ltd. ISBN-13. 978-0470873670

6.	**Evaluation Details: [Refer Table No. 5 of Academic Ordinances, Rules and Regulations]**

	Mid Sem: 30 Marks, End Sem: 50 Marks, Quiz/Internal assessment: 20 Marks, Total 100 Marks

7.	**Relationship of Course Outcomes to Program Outcomes:**

Mapping with POs (Departmental Reference)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	2	2											
CO2	3	2	2											
CO3	3	2	2											
CO4	3	2	2											
CO5	3	2	2											

High - 3; Medium – 2; Low – 1;

8.	**List of Indicative Laboratory Experiment (if applicable):**

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PHP102: Physics

Course Code & Course Title:	**PHP102 Physics**		
Course Type:	**BS**		
Name of the programme(s):	**B Tech (CSE/ECE/EEE/ME)**		
L – T – P	**0-0-2**	**No. of Credits**	**1**
Pre-requisites: Course Code(s) & Name(s)	**Nil**		
Course Equivalence: Course Code(s) & Name(s)			

1.	**Course Objective:**

1. The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies
2. To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipment.

	3. Design of circuits using new technology and latest components and to develop practical applications of engineering materials and use of principle in the right way to implement the modern technology.

2.	**Course Outcomes (Min. 3 & Max. 5):** Student will be able to:
CO1	Apply the concepts of quantum mechanics.
CO2	Apply the understanding for basics of semiconductors based on band theory applied to electronic devices
CO3	Understand the principle of LASER and apply it in optical fibres

3.	**Detailed Description of the Course**		
	List of experiments	**CO(s) Addressed**	**Duration in weeks**
1.	To study the characteristics of Photocell and to determine the work function of the cathode material.	CO1	1
2.	To calibrate an electromagnet and to study the dependence of Hall voltage on magnetic field and current through the sample.	CO2	1
3.	To study the I/P, O/P and transfer characteristics and to determine 'α' of transistor in common base mode	CO2	1
4.	To study the forward and reverse characteristics of PN junction diode and Zener diode.	CO2	1
5.	To determine the energy band gap in a semiconductor using reverse biased p-n junction diode.	CO2	1
6.	Study of voltage regulation using Zener diode.	CO2	1
7.	To determine numerical aperture of the optical fibre	CO3	1
8.	To determine wavelength of He-Ne LASER	CO3	1

4.	**Text books** 1. Experiments of Engineering Physics M.N. Avadhanulu, A.A. Dani, P.M. Pokley, S Chand Publishers (2003) ISBN-13- 978-8121912235 2. A Textbook of Engineering Physics Practical C. S. Robinson, Ruby Das, Lakshmi Publications Pvt Limited (2016) ISBN-13- 978-9380386867

5.	**Reference Book(s) and Other Required Material**

Course Code & Course Title:		**CSL101 COMPUTER PROGRAMMING**		
Course Type:		**DC**		
Name of the programme(s):		**B.Tech. Computer Science & Engineering**		
L – T – P		**3-0-2**	**Credits**	**4**
Pre-requisites: Course Code(s) & Name(s)		**None**		
Course Code(s)	**Equivalence: Course & Name(s)**			
6.	**Evaluation Details: [Refer Table No. 5 of Academic Ordinances, Rules and Regulations]**			

Continuous evaluation

7.	**Relationship of Course Outcomes to Program Outcomes:**

Mapping with POs (Departmental Reference)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	2	2					1	1					
CO2	3	2	2					1	1					
CO3	3	2	2					1	1					

High - 3; Medium – 2; Low – 1;

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CSL101: COMPUTER PROGRAMMING

1.	**Course Objective:** To develop students' proficiency in structured programming using C by teaching them essential constructs (variables, data types, operators, I/O, control flow), foundational problem-solving algorithms, modular and structured data handling (arrays, functions, structures), and basic file operations—empowering them to design, implement, and debug efficient, maintainable programs for real-world computational tasks.

2.	**Course Outcomes (Min. 3 & Max. 5):**
CO1	Remember and understand the fundamental programming constructs—such as program structure, data types, operators, expressions, and formatted I/O
CO2	Implement computational logic using decision structures and loops to solve problem
CO3	Analyze and modularize solutions using arrays, strings, and user-defined functions (including recursion) to implement algorithms

CO4	Apply and design structured data and persistent storage solutions by using C structures (including nested and arrays of structs) and basic file-handling operations (text and binary I/O).

3.	**Detailed Description of the Course**		

Topics		**CO(s) Addressed**	**Duration in weeks**
1	Introduction : Fundamentals of Computer programming, Program development and execution, basics of algorithms and flow charts and the software development lifecycle.	CO1	1.5
2	Basic constructs of C programming: Structure of Programs, Keywords and Identifiers, Variables and Data Types, Operators and Expressions (Precedence and Associativity, Type Conversions), Formatted Input/Output.	CO1	1.5
3	Control Flow: Decision Making and Branching (if, if-else), Loops (while, for). Algorithms such as swapping two variables, reversing digits, character-to-number conversion, generating primes, GCD, smallest divisor, factorial, and Fibonacci generation through loops, nested-loop pattern printing.	CO1,CO2	3
4	Data Organization & Modularity: Arrays and Strings (1-D arrays, 2-D arrays, basic string operations), Functions (user-defined functions, scope and lifetime of variables, recursive functions); Algorithms like array reversal, finding maximum number in a set, factorial computation, fibonacci sequence generation, reversing the digits of an integer; sorting and searching techniques and comparison.	CO3	3
5	Composite Data Types: structures, defining struct types, declaring instances, accessing members using the dot operator, memory layout and padding. Array of Structures: Declaring arrays whose elements are structures; Nested Structures: Embedding one struct type within another (either defined separately or inline), accessing nested members.	CO4	3
6	File handling: Opening and creating files, Closing files, Text file reading, Text file writing, Binary file reading, Binary file writing.	CO4	2

4.	**Text books (Theory and Practical):**

	1) The C Programming Language by Brian Kernighan and Dennis Ritchie. ISBN:9780131101630 2) How to Solve It by Computer by R. G. Dromey. ISBN-13. 978-8120303881

5.	**Reference Book(s) and Other Required Material**
	1. Algorithms in C by Robert Sedgewick ISBN-13:9780-0201314526 2. Algorithms (4th Edition) by Robert Sedgewick & Kevin Wayne ISBN-13: 978-0321573513 3. Introduction to Algorithms (commonly known as *CLRS*) by Cormen, Leiserson, Rivest & Stein ISBN-13: 978-0262033848

6.	**Evaluation Details: [Refer Table No. 5 of Academic Ordinances, Rules and Regulations]**

Code	**Type**	**Structure L+T+P**	**Credits**	**Evaluation Weightage (%)**	
				Method	**Range**
L	Lecture with built-in practical	L:3 T:0 P:4	L+0.5P	Mid Semester Exam.	25
				End Semester Exam.	50
				Quiz	10
				Continuous Evaluation-I (Pr.)	7.5
				Continuous Evaluation-II (Pr.)	7.5

7.	**Relationship of Course Outcomes to Program Outcomes:**

Mapping with POs (Departmental Reference)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	1		2		2			1	2			1		2
CO2	3	2	3		1		1	2		2	2	3	2	3
CO3	2	1	2	2	3	1		3			3	2	1	2
CO4	3	3	2	3	3	2	2	3	3	2	3	3	3	2

8.	**List of Indicative Laboratory Experiments (If Applicable):**	
Sr. No.	Sample Lab Assignments	CO Addressed
1	Basic Input-Output/Data types/data operators Calculation of simple interest and compound interest. Convert kilometers to miles Compute the area and perimeter of a rectangle or circle; perform temperature conversion between Celsius and Fahrenheit	CO1
2	Conditional Statements/ Loops Input month number and print number of days in a month Factorial Of a given number. Check the entered no is prime or not. Print patterns using nested loops. Swap using a temporary variable (baseline); swap using arithmetic/logical (without a temporary variable) Calculate compound interest annually or monthly using the iterative approach. Map month number to days; check if a year is a leap year Determine roots of a quadratic equation; use switch-case to build a basic calculator	CO1, CO2
3	Arrays : 1-D array, 2-D array , Strings : String functions, string.h library Input two sorted arrays and merge to one array. Search element from an array. Reverse an array element. Count vowels/consonants in a string; find string length manually and using strlen() Check palindrome strings, concatenate two strings, compare strings (strcmp), or count character frequency. Sorting and searching techniques implementation. Merge two sorted arrays into a third array and in-place merging.	CO2, CO3

4	Functions, Recursion and Structures. Call a simple function to find the sum of digits of a number. Recursive function to generate fibonacci series. Addition of complex numbers using structure. Store multiple records of student details using an array of structures. Determine if an input number is prime. Print all prime numbers up to N, or implement an optimized check via sqrt(n) method Binary search for a sorted array, and discussion on iterative vs. recursive implementation Reduce using recursion; compute factorials in an array or vector. Use a structure to add two complex numbers. Store and process multiple student records using an array of structures (find average, top scorer, etc.).	CO3, CO4
5	File handling. Count the number of words and characters in a given text file. Replace the specific line from a file. Copy the content of source file into destination file Count words and characters in a text file; write content from one file to another. Number and print lines with fgets/fputs; search and replace a specific line in a file	CO4

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EEL103: Electrical Engineering

Course Code & Course Title:	**EEL103 Electrical Engineering**		
Course Type:	**ES**		
Name of the programme(s):	**B.Tech. - CSE, CHEM, ECE, MECH**		
L – T – P	**3-0-0**	**No. of Credits**	**3**
Pre-requisites: Course Code(s) & Name(s)	**NIL**		
Course Equivalence: Course Code(s) & Name(s)			

1.	**Course Objective:**
	● To learn basic ideas and principles of Electrical Engineering

	• Understanding the details of electrical machines.

2.	Course Outcomes : Students will be able to
CO1	Understand the basics of electrical components and power system.
CO2	Calculate DC, AC, and magnetic circuits parameters using KCL and KVL.
CO3	Determine performance parameters of transformers.
CO4	Evaluate performance of electrical machines.

3.	Detailed Description of the Course		
Topics		**CO(s) Addressed**	**Duration in weeks**
Electrical Circuits: Circuit elements: resistance, inductance, and capacitance; voltage and current sources, definition, ideal and practical sources, source conversions, Kirchhoff's Laws and star-delta transformation.		CO1	2
Magnetic Circuits: Flux, MMF, reluctance; analogy with electric circuits; simple calculations for composite magnetic circuits.		CO1	2
AC Circuits: Periodic signals, average and R.M.S. values, phasor representation, steady-state analysis of ac circuits with sinusoidal excitation, reactance and impedance, series and parallel AC circuits, power factor, active, reactive and apparent power, series and parallel resonance, principle of generating single-phase and three-phase voltages, Balanced three-phase AC systems: Voltages, currents, and powers in star and delta connected load.		CO2	3.5
Single phase Transformers: Construction, types, basic principles, EMF equation, ideal and practical transformers, equivalent circuits, voltage regulation, and efficiency.		CO3	2.5
DC Motors: Construction, types, applications, significance of Back EMF, Speed and Torque equations, speed control, and need of motor starter.		CO4	1.5
Induction Motors: Three-phase induction motor—construction, types, applications, revolving magnetic field, principle of operation, synchronous speed, rotor speed, slip, power flow diagram, torque equation, and T-s characteristics. Block diagram of induction motor drive. Single-phase induction motors— principle of operation, types and applications.		CO4	1.5
Introduction to Generation, Transmission and Distribution of Electricity		CO1	1

4.	**Textbooks** 1. D. C. Kulshreshtha, Basic Electrical Engineering, Second Edition, McGraw-Hill, 2019, ISBN: 9353167213. 2. S.K. Bhattacharya , Basic Electrical and Electronics Engineering, Second Edition, Pearson Education, 2017, ISBN: 9789332586505.

5.	**Reference Book(s) and Other Required Material** ● Edward Hughes, Electrical and Electronic Technology, Tenth Edition, Pearson Education, 2010, ISBN: 9788131733660. ● Kothari D.P. and Nagrath I.J., Basic Electrical Engineering, Fourth Edition, McGraw-Hill, 2019, ISBN: 9353165725. ● N. K. De, G. D. Roy, T. K. Bhattacharya, IIT Kharagpur, Basic Electrical Technology, Web course of NPTEL

6.	**Evaluation Details: [Refer Table No. 5 of Academic Ordinances, Rules and Regulations]** Mid Sem: 20-30 Marks, End Sem: 50-60 Marks, Quiz/Internal assessment: 10-20 Marks, Total 100 Marks

7.	**Relationship of Course Outcomes to Program Outcomes:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	1	1			1	2		3
CO2	2	2	1	1	1			1	2		3
CO3	3	2	1	1	1			1	2		3
CO4	3	2	1	1	1			1	2		3

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EEP103 Electrical Engineering

Course Code & Course Title:	**EEP103: Electrical Engineering**
Course Type:	**ES**
Name of the programme(s):	**B.Tech. - CSE, CHEM, ECE, MECH**

L – T – P	0-0-2	No. of Credits	1
Pre-requisites: Course Code(s) & Name(s)	**NIL**		
Course Equivalence: Course Code(s) & Name(s)			

1.	Course Objective:
	● To verify basic ideas and principles of various Electrical Circuits. ● Understanding the principle and operation of electrical machines.

2.	Course Outcomes : Students will be able to
CO1	Understand behaviour of R, L, C circuit elements, voltage and current sources.
CO2	Appreciate and analyse magnetic circuits.
CO3	Familiar with various machines operations
CO4	Verify various parameters of three phase circuits.

3.	Detailed Description of the Course	
Topics (List of Experiments)	**CO(s) Addressed**	**Duration in Weeks**
1. Study and verification of Kirchhoff's Laws applied to direct current circuit.	CO1	1
2. Determination of B-H curve of a magnetic material	CO2	1
3. Study of AC series circuits.	CO1	1
4. Study of AC Parallel circuits.	CO1	1
5. To determine Voltage regulation and efficiency of a single phase transformer by direct loading.	CO3	1
6. Reversal of direction of rotation of a three phase induction motor.	CO3	1
7. To study balanced three phase circuit- star connection.	CO4	1
8. To study balanced three phase circuit- delta connection.	CO4	1
9. Speed control of a DC motor by varying :- a. Field current with armature voltage kept constant b. Armature voltage with field current kept constant.	CO3	1

10. Assessment 1 + Assessment 2 + Quiz / Viva	All COs	5

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MAL101: MATHEMATICS-I

Course Code & Course Title:	**MAL101: MATHEMATICS-I**		
Course Type:	**DC**		
Name of the programme(s):	**B.Tech.(CME, CIV, CSE, ECE, EEE, MIN)**		
L – T – P	**3-1-0**	**No. of Credits**	**4**
Pre-requisites: Course Code(s) & Name(s)			
Course Equivalence: Course Code(s) & Name(s)			

1.	**Course Objective:** The objective of this subject is to expose students to understand the basic importance of Differential calculus, Integral calculus, Infinite series, and Matrix theory in science and engineering.

2.	**Course Outcomes (Min. 3 & Max. 5):** After completing this course, students will be able to
CO1	Test the convergence of sequence and series.
CO2	Deal with differential calculus of functions of single variable and its applications.
CO3	Understand concepts of integration of functions of single variables and their applications.
CO4	Understand basic concepts of matrix theory and can apply it to solve problems of Engineering

3.	**Detailed Description of the Course**		
Topics		**CO(s) Addressed**	**Duration in weeks**

Sequences and Series: Sequences of real and complex numbers, Monotonic sequence, Bounded Sequences, Convergence of Sequence. Infinite series, tests of convergence (Comparison test, Ratio test, Root test, Raabe's test, Logarithm test and Integral test statements only), absolute and conditional convergence, power series, radius of convergence.	CO 1	3-4 weeks
Differential Calculus of function of single variable: Review of limit, continuity, and differentiability. Mean value theorems: Rolle's theorem, Lagrange's theorem, Cauchy's theorem, Taylor's theorem with Lagrange's form of remainder, curve tracing.	CO 2	3-4 weeks
Integral Calculus: Fundamental theorem of Integral calculus, mean value theorems, evaluation of definite integrals. Differentiation under integral sign including variables limits-Leibnitz rule (without proof). Applications in area, length, volumes, and surface of solids of revolutions. Improper integrals and tests for convergence, Beta and Gamma functions,	CO 3	3-4 weeks
Matrices: Gauss-Elimination and Gauss-Jordan Elimination methods for solving system of linear equations, Rank of matrix, consistency of a system of equations, linear dependence and independence, linear and orthogonal transformations, Eigenvalues and eigenvectors, Cayley-Hamilton theorem, reduction to diagonal form, Hermitian and skew Hermitian matrices, Quadratic forms.	CO 4	3-4 weeks

4.	**Text books** i) Jain, R.K. and Iyengar, S.R.K., Advanced Engineering Mathematics; Narosa Publishers. **ii)** James Stewart, Calculus-Early transcendentals, 5th edition, Thomson™ Brooks/Cole -Indian Edition, 2007 iii) Kreyszig, E, Advanced Engineering Mathematics, 8th Edition, John Wiley & Sons. **iv)** Thomas, G.B. and Finney, R.L., Calculus and Analytic Geometry, 9th Edition, Addison-Wesley Longman, Inc.

5.	**Reference Book(s) and Other Required Material**

	i) Piskunov, N., Differential and Integral calculus, Vol.1, Vol.2 MIR Publishers, Moscow – CBS Publishers and Distributors (India). **ii)** Sudhir R. Ghorpade, Balmohan V. Limaye, A Course in Calculus and Real Analysis, 2nd Edition, Springer, New York, NY. 2018.

6.	**Evaluation Details: [Refer Table No. 5 of Academic Ordinances, Rules and Regulations]** Mid Sem: 20-30 Marks TA: 10-20 Marks End Sem: 50-60 Marks

7.	**Relationship of Course Outcomes to Program Outcomes:**

	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO 8	PO9	PO10	PO11	PSO 1	PSO2	PSO3
CO1	3	2	1								2			
CO2	3	2	1								2			
CO3	3	2	1								2			
CO4	3	2	1								2			

Mapping with POs (Departmental Reference)*High - 3; Medium – 2; Low – 1;*

8.	**List of Indicative Laboratory Experiment (if applicable): NA**

ICL1XX ENVIRONMENTAL STUDIES

Course Code & Course Title:	**ICL1XX ENVIRONMENTAL STUDIES**		
Course Type:	**IC**		
Name of the programme(s):	**B. Tech.**		
L – T – P	**2 – 0 - 0**	**No. of Credits**	**02**
Pre-requisites: Course Code(s) & Name(s)	**--**		

Course Equivalence: Course Code(s) & Name(s)	--

1.	Course Objective:
	To familiarize students with: • Various natural resources, their significance, and current status. • The concepts, structure, and functions of ecosystems. • The importance of biodiversity and its conservation. • The causes, consequences, and preventive measures for different forms of environmental pollution. • The social and climatic changes arising from environmental pollution.

2.	Course Outcomes:
CO1	Explain various natural resources, their significance, and current status.
CO2	Describe the concepts of ecosystems and biodiversity, including their structure, functions, and conservation methods.
CO3	Analyze the causes and consequences of different forms of environmental pollution, along with preventive measures.
CO4	Examine the social and climatic changes resulting from pollution, population growth, and their impact on the environment.

3.	Detailed Description of the Course		
Topics		CO(s) Addressed	Duration in weeks
Natural resources: Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources.		CO1	04

Ecosystem: Concept of an ecosystem, Structure and functions of an ecosystem, Producers, consumers and decomposers, Food chain, food webs and pyramids. **Biodiversity and its conservation: Introduction, definitions: genetics, species and diversity, Value of biodiversity, Biodiversity at global, national and local level, India as a mega-diversity nation, Hot-spot of biodiversity, Threat to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Conservation of biodiversity: in-situ and ex-situ conservation.**	**CO2**	**03**
Environmental pollution: Definition, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes.	**CO3**	**06**
Social issues and environment: Sustainable development, Water conservation, Rain water harvesting, Watershed management, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accident, Environmental rules and regulations. **Human population and environment: Population growth, Environment and human health, Human rights, Value education, Role of information technology in environment and human health.**	**CO4**	**02**

4.	**Text books**

i) **Rajgopalan R., Environmental Studies, 3rd Edition, Oxford University Press, 2023. ISBN: 13. 9789354978944**

ii) **Benny Joseph, Environmental Studies, 3rd Edition, McGraw Hill, 2017. ISBN: 10. 9352605179**

iii) **Erach Barucha, Environmental Studies, 3rd Edition, Universities press (India), 2025, ISBN: 9789389211788**

5.	**Reference Book(s) and Other Required Material**

i) **Rao M. N. and Rao H.V.N., Air Pollution, 1st Edition, McGraw-Hill**

Publishing Company Limited, 2007. ISBN: 13, 978-0074518717.

ii) Rao C.S., Environmental Pollution Control Engineering, 3rd Edition, Wiley Eastern Limited, New Age International Limited, 1995. ISBN: 13. 978-9386649898.

6.	**Evaluation Details:**
	• **Mid Term Examination: 30 Marks** • **Continuous Assessment (Seminars): 10 Marks** • **End Term Examination: 60 Marks** • **Total Marks: 100**

7.	**Relationship of Course Outcomes to Program Outcomes:**

Mapping with POs (Departmental Reference)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	3	1	3	1	3	2	3	2	3	3	3	3	3	3	3
CO 2	3	1	3	1	3	2	3	2	3	3	3	3	3	3	3
CO 3	3	1	3	1	3	2	3	2	3	3	3	3	3	3	3
CO 4	3	1	3	1	3	2	3	2	3	3	3	3	3	3	3

High - 3; Medium – 2; Low – 1;

8.	**List of Indicative Laboratory Experiment (if applicable):**

NA

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HUL1XX English and Corporate Communication

Course Code & Course Title:	**HUL1XX English and Corporate Communication**		
Course Type:	**HU**		
Name of the programme(s):	**B.Tech. - Electrical and Electronics Engineering**		
L – T – P	**2-0-2**	**No. of Credits**	**3**
Pre-requisites: Course Code(s) & Name(s)	**NIL**		
Course Equivalence: Course Code(s) & Name(s)			

1.	**Course Objective:**
	• **To impart to the students the skills that they need in their academic and later in their professional pursuit.**

2.	**Course Outcomes:**
CO1	**Acquaint learners with basic of communication**
CO2	**Familiarize learners with nuances of corporate communication**
CO3	**Emphasize the importance of verbal and non-verbal communication**
CO4	**Discuss key features of corporate communication**
CO5	**Prepare learners for workplace challenges**

3.	**Detailed Description of the Course**		
Topics		**CO(s) Addressed**	**Duration in weeks**
Introduction to Communication **Principles of Communication** **Channels of Communication** **Inclusive Communication Practices** **Speaking and Listening Skills for Communication**		**CO1**	**2.5**

Introduction to Corporate Communication **Different Forms of Corporate Communication** **Factors Influencing Corporate Communication** **Interpersonal Communication** **Communication for Effective Leadership**	**CO2**	**2.5**
Verbal and Non-verbal Communication **Reading and Writing Skills for Corporate Communication** **Nonverbal Communication in Corporate Setting** **Interview and Group Discussion** **Presentation Skills**	**CO3**	**4**
Features of Corporate Communication **Levels of Corporate Communication** **Barriers to Communication** **Organizational Communication** **Dos and don'ts of corporate communication**	**CO4**	**2.5**
Strategies of Communication **Negotiating Conflict and Management** **Crisis Communication** **Emotional Intelligence and Stress Management** **Ethics in Corporate Communication**	**CO5**	**2.5**

4.	**Textbooks**

i) Joep Cornelissen, Corporate Communication: A Guide to Theory and Practice, 6th Edition, SAGE Publications, 2020, ISBN 1526491982.

ii) Meenakshi Raman and Prakash Singh, Business Communication, 2nd Edition, Oxford University Press, 2012, ISBN 9780198077053.

iii) Shirley Taylor and V. Chandra, Communication for Business: A Practical Approach, 1st Edition, Pearson, 2010, ISBN 9788131727652.

5.	**Reference Book(s) and Other Required Material**

i) Ashraf Rizvi, *Effective Technical Communication*, 2nd Edition, McGraw Hill Education, 2017, ISBN 9352605780.

ii) Courtland L. Bovee, John V. Thill, et al., *Business Communication Today*, 14th Edition, Pearson, 2018, ISBN 9789353062682.

iii) Mary Ellen Guffey and Dana Loewy, *Business Communication: Process and Product*, 10th Edition, South-Western College Publishing, 2021, ISBN 0357129237.

iv) Paul A. Argenti, *Corporate Communication*, 7th Edition, McGraw-Hill Education,

2016, ISBN 9814636193.

Sharon Gerson and Steven Gerson, *Technical Communication: Process and Product*, 8th Edition, Pearson Education India, 2014, ISBN 9332518599.

6.	**Evaluation Details: [Refer Table No. 5 of Academic Ordinances, Rules and Regulations]**

Mid Semester Examination – 20 Marks, Teacher Defined Assessment – 20 Marks, End Semester Examination – 60 Marks, Total Marks-100

7.	**Relationship of Course Outcomes to Program Outcomes:**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PS O1	PS O2	PS O3	PS O4
CO 1										3		2	1		2
CO 2									3			2	2	1	1
CO 3							3			3	3	1			
CO 4								3							
CO 5												1	1	1	1

8.	**List of Indicative Laboratory Experiment:**

Week 1. Ice Breaker
Week 2. Oral Presentation
Week 3. Listening Activity
Week 4. Role Play
Week 5. Group Discussion
Week 6. Writing Activities
Week 7. Peer Interview
Week 8. PPT Presentation
Week 9. Debate
Week 10. Corporate Meeting
Week 11. Case Study
Week 12. Interviewing Strangers

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SAA101- Health Information and Sports-Part I

Course Code & Course Title:	**SAA101- Health Information and Sports-Part I**		
Course Type:	**MNC**		
Name of the programme(s):	**SAA101 Health Information and Sports-Part I**		
L – T – P	**0-0-2**	**No. of Credits**	**0**

1.	**Course Objective:**
	· **To provide information about physical, physiological & psychological aspects of sports & physical.** · **To create awareness among the students about their health status, by conducting various physical fitness tests and suggest them suitable remedial physical fitness programme.** · **To make students aware about the rules and regulation of different games & sports.** · **To provide opportunity to mingle with each other through participating in different physical education & sports activities.** · **To deliver the knowledge of daily calorie requirement to manage the obesity**

2.	**Course Outcomes:**
CO1	**Enriched proper knowledge among the students about emerging issues such as health & fitness, wellness etc.**
CO2	**Students will become aware about the sense of discipline & dedication in general life, develop the spirit of team work through various physical education & sports activities.**
CO3	**Development of rational thinking and scientific temper among the students.**

3.	**Detailed Description of the Course**

Topics	CO(s) Addressed	Duration in weeks
Introduction to psychological problem of a sports person	CO1,CO2,CO3	8-12
Warming up, cooling down & full body stretching and its importance	CO1,CO2,CO3	8-12
Obesity & its Management :Daily caloric requirements and daily energy expenditure	CO1,CO2,CO3	8-12
Scientific principles of training	CO1,CO2,CO3	8-12
Health & performance related physical fitness	CO1,CO2,CO3	8-12

4.	Practical		
Topics		CO(s) Addressed	Duration in weeks
Practice of skills of major games like: Badminton, Table Tennis, Chess, Yoga, Basketball, Football, Handball, Cricket, Kho-Kho , Lawn Tennis, Throw ball, Athletics & Kabaddi		CO1,CO2,CO3	8-12
Screening of health related physical Fitness		CO1,CO2,CO3	8-12
Participation in Intramural Sports Program		CO1,CO2,CO3	8-12
Preparation for Physical Efficiency Test Level-1		CO1,CO2,CO3	8-12

5	Reference Books & other required materials
	i) Arnold G. Nelson,(2007),“Stretching Anatomy” Human Kinetics: Online available : https://www.therajordanmassage.com/doc/3_%20Stretching%20Anatomy.pdf ii) Matt Jarvis, Sports Psychology, Taylor & Francis e- library, 2005 iii) Tudor O Bompa and G Gregory Haff, Periodization theory & methodology of training, 5th Edition, Human Kinetics 2009

6.	**Evaluation Details: [Refer Table No. 5 of Academic Ordinances, Rules and Regulations]**
	Continuous evaluation Assessment- End Semester 100%

Syllabus of 2nd Semester B. Tech. in CSE (160 Credits)

ECL1XX: BASICS OF ELECTRONICS ENGINEERING

Course Code & Course Title:	**ECL1XX: BASICS OF ELECTRONICS ENGINEERING**		
Course Type:	**ES**		
Name of the programme(s):	**B. Tech. in Computer Science & Engineering**		
L – T – P	**3-0-2**	**No. of Credits**	**4**
Pre-requisites: Course Code(s) & Name(s)	**None**		
Course Equivalence: Course Code(s) & Name(s)	**-**		

1.	**Course Objective:** To provide in depth knowledge about basics of electronics.

2.	**Course Outcomes :** Students will be able to
CO1	Demonstrate basics of diodes, BJTs, FET and solid state devices,ADC,DAC
CO2	Analyse various digital circuits and combinational circuits
CO3	Describe basic working principle of sensors and microcontroller.
CO4	Describe various elements of communication systems.
CO5	Implement various applications using Arduino microcontroller and sensors

3.	**Detailed Description of the Course**		

Topics	CO(s) Addressed	Duration in weeks
Introduction to Semiconductor Devices : Diode, Zener circuits, solar cell, photoconductors, PIN photodiode, avalanche photodiode, LED, semiconductor lasers , rectifiers, DC Power supply. Introduction to BJT, MOSFET, OPAMP , Oscillators, 555 based LED blinker and Timer	CO1	3
Boolean logic, basic gates, truth tables, logic minimization using K maps, Number system (Binary, octal, hexadecimal, excess-3,etc), 2's complement representation, code converters(BCD to 7 segment and others), universal gates, MUX and DEMUX, overview of Sequential circuits such as Flip-flops and counters	CO2	3
Introduction to Different types of sensors: Hall effect sensors; Piezoelectric sensors; Micro-sensors. Sensors for displacement, pressure, temperature, flow etc. Optical sensors; chemical and bio-sensors. Sensor parameters: non-idealities, Sensitivity, SNR, power/energy, form-factor , Sensor read-out, interfacing of sensors	CO3	3
Digital-to-analog converters (DAC), Analog-to-digital converters (ADC)- Types of ADC and DAC	CO1	2
Introduction to Arduino IDE, Arduino - Download and Installation, Syntax, Variables, Data types, Structures- loop, setup, Arithmetic operators, Control Structures, Comparison operators, Bitwise operators, Key Functions – Pin Mode, Analog Read, Analog Write, Digital Read, Digital Write	CO5	3
Introduction to Communication systems: Introduction to Analog and digital communication, types of modulation, antennas and their types, overview of current wireless standards	CO4	2

4.	Text books
	(i) Adel S. Sedra and Kenneth C. Smith", "Microelectronics Circuits", Eighth Edition "Oxford University Press (ii) David Hanes, et.al., IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Pearson, 2017. (iii) Jacob Freden, Handbook of Modern Sensors – Physics, Designs, and Applications, 4th ed, Springer, 2010 (iv) Lathi B.P.; Modern Analog & Digital Communication Systems; (v) R.P jain ,"Modern Digital Electronics" fourth edition, Mc Graw hill

5.	Reference Book(s) and Other Required Material

	(i) John WileyDesign - With an Introduction to Verilog HDL, Moris Mano and M. D. Ciletti,Pearson, 5th Edition (ii) D Roy Choudhury ,Shail Bala jain –"Linear Integrated Circuits", 6th edition,new age international publishers

6.	**Evaluation Details: [Refer Table No. 5 of Academic Ordinances, Rules and Regulations]**
	Mid Semester Exam. 20-30 Teacher Defined Assessment 20 End Semester Exam. 50-60

7.	**Relationship of Course Outcomes to Program Outcomes:**

Mapping with POs (Departmental Reference)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	1	-	-	1	-	-	1	-	-	2	-	1	1
CO2	3	1	-	-	-	-	-	1	-	-	1	1	1	1
CO3	3	3	3	-	1	-	-	1	-	1	1	3	3	2
CO4	3	-	-	-	-	-	-	1	-	-	1	1	1	1
CO5	3	3	3	-	1	-	1	1	-	1	1	1	2	2

High - 3; Medium – 2; Low – 1*;*

8.	**List of Indicative Laboratory Experiment (if applicable):**
	1. Testing of various diodes, their characteristics 2. Testing of Bipolar Junction Transistor, Field effect transistor and their characteristics 3.Testing of digital oscilloscope & function generator • Probe checking and calibration/adjustment/compensation. • Study of trigger menu/auto setting • Observing waveforms of function generator O/P. 4. Various applications of 555 timer IC 5. Experiments on logic gates, flip flop etc. 6.Arduino microcontroller experiments – ● Programs with interfacing of basic I/O devices (LEDs and Switches) ● Programs with Motor control 7. Application based Programs with interfacing of Sensors to measure various Parameters- such as temperature, humidity etc.

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MAL102: Mathematics II

Course Code & Course Title:	**MAL102 – Mathematics II**		
Course Type:	**BS (Basic Science)**		
Name of the programme(s):	**B.Tech.(CME, CIV, CSE, ECE, EEE, MIN)**		
L – T – P	**3 – 1 – 0**	**No. of Credits**	**4**
Pre-requisites: Course Code(s) & Name(s)	**-**		
Course Equivalence: Course Code(s) & Name(s)	**Nil**		

1.	**Course Objective:** To expose students to multivariable calculus (differential and integral), vector calculus, and ordinary differential equations with an emphasis on engineering applications.

2.	**Course Outcomes (Min. 3 & Max. 5):**
CO1	Deal with differential calculus of functions of several variables and their applications.
CO2	Understand concepts of multiple integrals and their applications in engineering problems.
CO3	Understand the concepts of vector calculus and its applications in engineering and science.
CO4	Solve standard classes of ordinary differential equations related to science and engineering.

3.	**Detailed Description of the Course**		
Topics		**CO(s) Addressed**	**Duration in weeks**
Calculus of functions of several variables: Limits, continuity and differentiability; partial derivatives and geometry; tangent plane and normal line; Euler's theorem for homogeneous functions; total differential and chain rule; Jacobians; Taylor formula; extrema (maxima, minima, saddle points); Lagrange multipliers.		CO1	3
Multiple integrals: Double integrals; change of order and change of variables; applications to area, volume, mass, centre of gravity. Triple integrals; change of variables; applications to volume, mass, centre of mass and moments of inertia.		CO2	3
Vector calculus: Scalar and vector fields; gradient and directional derivative; divergence and curl; solenoidal and irrotational fields. Line, surface and volume integrals; Green's, Stokes' and Gauss' divergence theorems (statements and applications).		CO3	3

Ordinary differential equations: First-order equations—exact equations, integrating factors, reducible to exact, linear and Bernoulli, orthogonal trajectories; existence and uniqueness (statement), Picard's iteration (statement). Second and higher order linear ODEs with constant coefficients; linear independence; method of variation of parameters; Cauchy–Euler equations; systems of linear ODEs (overview).	CO4	3

4.	**Text books** i) Jain, R. K., and Iyengar, S. R. K., Advanced Engineering Mathematics, 4th ed., Narosa Publishing House, 2014. ii) James Stewart, Calculus-Early transcendentals,5e, Thomson™ Brooks/Cole -Indian Edition, 2007 iii) Kreyszig, E., Advanced Engineering Mathematics, 10th ed., John Wiley & Sons, 2011. iv) Thomas, G. B., and Finney, R. L., Calculus and Analytic Geometry, 9th ed., Addison-Wesley, 1996.

5.	**Reference Book(s) and Other Required Material** i) Ghorpade, S. R., and Limaye, B. V., A Course in Multivariable Calculus and Analysis, Springer, 2010. ii) Greenberg, M. D., Advanced Engineering Mathematics, 2nd ed., Pearson Education, 2002. iii) Piskunov, N., Differential and Integral Calculus (Vol. 1 & Vol. 2), Mir Publishers/CBS Publishers and Distributors (India).

6.	**Evaluation Details:** Mid Sem: 20-30 Marks TA: 10-20 Marks End Sem: 50-60 Marks

7.	**Relationship of Course Outcomes to Program Outcomes:**

Mapping with POs (Departmental Reference)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3

Course Code & Course Title:	**CSL213: DATA STRUCTURES & PROGRAM DESIGN – I**
Course Type:	**DC**
Name of the programme(s):	**B.Tech. Computer Science & Engineering**
L – T – P	**3-1-2** **No. of Credits** **5**
Pre-requisites: Course Code(s) & Name(s)	**CSL101: Computer Programming.**
Course Equivalence: Course Code(s) & Name(s)	

CO1	3	2	1								2			
CO2	3	2	1								2			
CO3	3	2	1								2			
CO4	3	2	1								2			

High - 3; Medium – 2; Low – 1;

8.	**List of Indicative Laboratory Experiment (if applicable):**

Not applicable for this course

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CSL213: DATA STRUCTURES & PROGRAM DESIGN – I

1.	**Course Objective:** Given knowledge about structured programming, third semester CSE students should develop skills to create error free and efficient programs; by applying data-structures fundamentals and program analysis techniques.

2.	**Course Outcomes (Min. 3 & Max. 5):**
CO1	Recognize the basics of computing and counting. Formulate a problem, devise an algorithm and transform into code. Demonstrate ability to write structured and error-free programs using techniques like iteration / recursion and loop-invariants.
CO2	Compare, contrast and analyze different sorting and searching algorithms, selection of appropriate algorithmic techniques as per the properties of given data set. Analyze the complexity/efficiency of the algorithm and develop ability to improve the same
CO3	Demonstrate understanding of the concept of dynamic memory allocation and its utilization, dynamic data structures and implementation.
CO4	Recognize the need of Abstract Data Type and implement ADTs like Stacks and Queues.
CO5	Develop a s/w project as a real-life application with team work.

3.	**Detailed Description of the Course**		
Topics		**CO(s) Addressed**	**Duration in weeks**
Types and operations, Iterative constructs and loop invariants, Quantifiers and loops, Structured programming and modular design, Illustrative examples, Scope rules, parameter passing mechanisms, recursion, program stack and function invocations including recursion,		1	4
Overview of arrays and array-based algorithms - searching and sorting, Divide and Conquer – Merge sort, Quicksort, Binary search, Introduction to Program complexity (Big Oh notation), Recurrence relations. Sparse matrices.		1, 2, 5	3
Structures (Records) and array of structures (records). Database implementation using array of records. Dynamic memory allocation and deallocation. Dynamically allocated single and multi-dimensional arrays. Files, operations on them, examples of using file.		3, 5	3
Concept of an Abstract Data Type (ADT), Lists as dynamic structures, operations on lists, implementation of linked list using arrays and its operations. Introduction to linked list implementation using self-referential-structures/pointers.		4, 5	2
Stack, Queues and its operations. Implementation of stacks and queues using both array-based and pointer-based structures. Uses of stacks in simulating recursive procedures/ functions. Applications of stacks and queues.		4,5	2

4.	**Text books**
	i. Brian Kerninghan and Dennis Ritchie, The C programming language, 2nd Edition, Pearson India, 2015, ISBN-13 9789332549449. ii. R. G. Dromey, How to Solve it by Computer, 1st Edition, Pearson India, 2007, ISBN-13 9788131705629

	iii. Robert Kruse, G. L. Tondo, B. Leung, Shashi Mogalla, Data Structures & Program Design in C, 2nd Edition, Pearson India, 2006, ISBN-13 978-8177584233

5.	**Reference Book(s) and Other Required Material**
	i. Robert Sedgewick, Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms, Addison Wesley, 3rd Edition, ISBN-13 9780201756081

6.	**Evaluation Details: [Refer Table No. 5 of Academic Ordinances, Rules and Regulations]**
	Mid-Term - 20% Quizzes - 16% Lab-exams - 16% Course Assignment - 8% End-Sem - 40%

7.	**Relationship of Course Outcomes to Program Outcomes:**

Mapping with POs (Departmental Reference)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	3										3	3	
CO2	1	3			2							2	3	
CO3	2	2			2							3	3	
CO4	3	3										1	3	
CO5			1	1	3	3	1	1	1	1	3			3

High - 3; Medium – 2; Low – 1;

8.	**List of Indicative Laboratory Experiment (if applicable):** **LAB ASSIGNMENTS:** 1. Sum of series problems using loop invariants 2. Efficient algorithms to determine primality, list of primes, largest factors with specific properties efficiently etc.

Course Code & Course Title:	**CSL226: DIGITAL CIRCUITS AND MICROPROCESSORS**		
Course Type:	**DC**		
Name of the programme(s):	**B.Tech. Computer Science & Engineering**		
L – T – P	**3-0-2**	**No. of Credits**	**4**
Pre-requisites: Course Code(s) & Name(s)	**None**		
Course Equivalence: Course Code(s) & Name(s)			

3. Exercises on recursion e.g. binary representation in different orderings, combinations, efficient fibonacci series computation, towers of hanoi, etc.
4. Array algorithms for finding kth minimum, kth maximum, removal of duplicates, longest plateau, longest monotone subsequence etc.
5. Array sorting algorithms like selection sort, insertion sort, modified bubble sort, quicksort, merge sort, and variations on the same.
6. Implementation of database for real-life situation using array of structures and array algorithms
7. Implementation of Stacks and Queues using arrays

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CSL226: DIGITAL CIRCUITS AND MICROPROCESSORS

1.	**Course Objective:** ● Understand, analyze and evaluate the performance of various components of digital systems of medium complexity. ● Understating of the architecture and programming issues of microprocessor. Apply the acquired knowledge to interface various programmable devices to the microprocessor and able to build the medium scale microprocessor-based system.

2.	**Course Outcomes (Min. 3 & Max. 5):**
CO1	Ability to understand the basic concepts about the digital circuits, microprocessor architecture, programming techniques, and interfacing.
CO2	Ability to apply the acquired knowledge to analyze, design and solve the problems in the concerned area.
CO3	The student should be able to build, evaluate, and propose solutions to the problems in the area of digital circuits, of medium complexity, that are based on SSIs, MSIs, and programmable logic devices.

3.	Detailed Description of the Course		
Topics		**CO(s) Addressed**	**Duration in weeks**
Motivation for digital logic and digital circuits/systems, Analog vs. Digital Systems, basic concepts on SSI, MSI, VLSI circuit classification. Boolean algebra, Postulates and Theorems. Binary Codes: Weighted, non-weighted, error detecting and error correcting codes. Logic Gates, Truth tables, Sum of products, product of sums, Minimization of functions, Karnaugh maps and Simplification of logical functions using Quine-Mclausky method.		CO - 1	5 Weeks
Combinational Circuit: Adders (ripple and carry look-ahead addition) and subs tractors Decoders/Encoders, multiplexers/ DE multiplexers, code converters, realizing functions using Decoders, Multiplexers. Sequential Circuits: Flip-flops and latches: D, T, J/K flip-flops, Master Slave Flip flops, and shift registers. Counters (Synchronous/Asynchronous), different module counters with reset/clear facility, asynchronous and synchronous design using state and excitation tables. FSM implementation (Sequence Detector).		CO - 2	5 Weeks
8085 based Microprocessor organization, memory, I/o organization. Address decoding, memory, I/O interfacing concepts. 8085 addressing modes, Instruction set, basic timing diagram. Assembly language programming, 8085 Interrupts, priorities. 8085 Interfacing with PPI –8255.		CO - 3	5 weeks

4.	**Text books**

5.	**Reference Book(s) and Other Required Material**
1	8085 Microprocessor by Ramesh Gaonkar.
2	Barry Brey, the Intel Microprocessors, PHI.
3	Bhaskar J, VHDL Primer, B.S. Publication.
4	Hall D.V., Microprocessors and Digital Systems, McGraw International.
5	KohaviZvi, “Switching & Finite Automata Theory”, TMH...
6	Stephen Brown,Vranesic Z, “Fundamentals of Digital Logic with VHDL Design”, TMH

6.	**Evaluation Details: [Refer Table No. 5 of Academic Ordinances, Rules and Regulations]**

7.	Relationship of Course Outcomes to Program Outcomes:

Mapping with POs (Departmental Reference)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	3	0	0	0	3	0	2	1	1	0	1		2
CO2	3	3	3	0	0	2	0	0	0	0	0		3	1
CO3	3	3	2	0	3	2	2	0	2	0	0	3		

High - 3; Medium – 2; Low – 1;

8.	List of Indicative Laboratory Experiment (if applicable):

LAB ASSIGNMENTS:

Aim 1.	A. B. C.	Investigate logic behaviour of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and buffer gates, use of Universal NAND Gate. To simplify the Boolean function and construct the circuit. To verify Demorgan's theorem for 2 variables.
Aim 2.	 A. B.	To design, construct and test N bit : Adder Circuit. Subtractor Circuit.
Aim 3.	 A. B.	Design, implement and test a given circuit example with : NAND Gates only. NOR Gates only.
Aim 4.	 A. B.	To design, construct and test N bit : Multiplier. Deviser.
Aim 5.	 A. B. C. D.	Implementation and verification of: SR flip flop. J-K flip flop. D flip flop. T flip flop.
Aim 6.		Design, and verify the all types of Shift Registers.
Aim 7.		Design, and verify the all types of Counters.
Aim 8.		Write an ALP to remove duplicate data bytes from memory segment starting from 2000H onwards for 30 bytes of data. Here delete means shifting all next data bytes at deleted memory location onwards.

Aim 9.		Write an ALP to check availability of sub string in all data bytes starting from 4000H onwards for 20 bytes. If substring found, store lower order address of respective memory location otherwise store higher order address of respective memory location in memory location starting from 5000H onwards. Sub string is "1010".
Aim 10.		Write an ALP to check 4^{th} bit of data stored at memory location 'AAAAH'. If 4^{th} bit is '0', store '00H' in memory location 'BBBBH'. If 4^{th} bit is '1', store 'FFH' in memory location 'BBBBH'. (Rotate instructions are not allowed here.)
Aim 11.		Write an ALP to find 2^{nd} largest number from given memory array starting from '2024H' onwards of size 20 bytes. Store the result into memory location 'DADAH'.
Aim 12.		Write an ALP to generate resultant data in register D whose 7^{th} bit is given by : $D_7 = D_2 \oplus D_5 \oplus D_6$. Store data in same register D.
Aim 13.		Write an ALP to find product of two numbers stored at memory location 'CAFEH' and 'CAFFH' using shift left and add method. Store the resulting data in memory location 'C0FEH'.
Aim 14.		Write an ALP to divide a 16 bit number stored at memory location '2001H' and '2002H' by 8 bit number stored at memory location '2003H'. Store the 8 bit quotient and 8 bit remainder in stack memory.
Aim 15.		Write an ALP to check whether count of number of 0s and 1s are equal or not in register B. If it is equal, set all flags. If it is not equal, reset all flags.

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CSP201: SOFTWARE LAB – I

Course Code & Course Title:	**CSP201: SOFTWARE LAB – I**		
Course Type:	**DC**		
Name of the programme(s):	**B. Tech. in Computer Science & Engineering**		
L – T – P	**0-1-2**	**No. of Credits**	**2**
Pre-requisites: Course Code(s) & Name(s)	**None**		
Course Equivalence: Course Code(s) & Name(s)	**-**		

1.	**Course Objective:** To effectively use the Unix programming environment - shell, file system, scripts, pipes, regular expressions, filters, program development tools and to use scripting languages, such as Awk, to automate tasks and write simple programs.

2.	Course Outcomes (Min. 3 & Max. 5):
CO1	Effectively use the UNIX programming environment - shell, file system, scripts, regular expressions, filters, program development tools.
CO2	Automate tasks and write simple programs using scripting languages, such as Awk.
CO3	Develop good programming style, organization, interface, and documentation habits.
CO4	Use of effective procedures and tools for building, debugging, testing, tuning, and maintaining programs.
CO5	Use of tools and write programs to assist in developing programs

3.	Detailed Description of the Course		
Topics		**CO(s) Addressed**	**Duration in weeks**
Introduction to Linux/Unix OS - ls, wc, chdir, mkdir, chmod, cd, mv, df, du, netstat, ps, more, set, env, setenv, chgrp, man, rm, rmdir, grep, vi, tar, untar, uuencode, find, cat, history, ping, ifconfig, traceroute,		1,2	1
Installing Linux (or any variant)		1,2	1
Introduction to using different tools for identification of possible errors in C program – gdb, concepts of “core dump”, backtracking using “bt”, using “info” to dump all registers, creating watch-list / watch variables.		3,4	2
DDD (Data Display Debugger) – introduction and usage.		4,5	1
IDE for code development Using DevCpp and/or Visual Studio		3,5	1
Create a project, using multiple .c and .h files with cross-references		3	2
Setting compiler options and linker options		5	1
Understanding different settings		5	1
Unix tools - Awk, sed, Emacs		1	1
Parameter passing to C program from shell (argc / argv)		3	1
Bash scripting – variables, conditionals, loops, finding logged in users		2	1
HTML, XML, XSD and HTML / XML parsing		5	2

4.	Text books
	i) “Advanced Programming in the UNIX Environment” by W. Richard Stevens – Deep dive into system calls, file handling, and Unix programming essentials. ISBN-10 : 0321525949 ISBN-13 : 978-0321525949

	ii) "C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie – The classic guide for writing robust C code, including memory issues and CLI parsing.ISBN-10 : 9332549443 ISBN-13 : 978-9332549449 iii) "Dive Into Systems" by Suzanne Matthews and Tia Newhall – Excellent modern intro to systems programming, command-line arguments, and memory. ISBN-10 : 1718501366 ISBN-13: 978-1718501362 iv) "Programming in C" – Karpagam College Notes – Covers command-line arguments and essential user-defined data types.

5.	**Reference Book(s) and Other Required Material**
	i) Command Line Arguments in C" – *GeeksforGeeks Article* – Hands-on guide to handling inputs using argc and argv. ii) "Debugging Segmentation Faults in C" – *CodingEasyPeasy Guide* – Practical help with common gdb techniques. iii) "Debugging with GDB" – *Free Software Foundation* – Step-by-step official documentation on using GNU Debugger. iv) "GeeksforGeeks: How to Find Segmentation Error in C Using GDB" – Detailed walkthrough for identifying and fixing runtime memory errors. v) "LabEx Tutorial: How to List Hidden Files on Unix with the ls Command" – Beginner-level explanation of ls, including -a, -A flags. "Linux Handbook: Show Hidden Files With ls Command" – *by Abhishek Prakash* – Simple guide for understanding hidden files and ls variations. vi) "Segmentation Faults in C – A Comprehensive Guide" – *The Linux Code* – Describes reasons and debugging techniques for memory errors.

6.	**Evaluation Details: [Refer Table No. 5 of Academic Ordinances, Rules and Regulations]**

7.	**Relationship of Course Outcomes to Program Outcomes:**

Mapping with POs (Departmental Reference)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO1	3	3	3	2	2				2		2	3		
CO2	3	2	3	2	2				3		3		3	
CO3	3	3	3	3	3	2			1		2	3		

CO4	3	2	3	3	1	2			3		3	2		2
CO5	3	3	3	3	2				2		2	3	3	

High - 3; Medium – 2; Low – 1;

8. List of Indicative Laboratory Experiment (if applicable):

LAB ASSIGNMENTS:

Question 1: Use the ls command to list all files and directories in your home directory, including hidden files.

Question 2: Write a C program that intentionally causes a segmentation fault. Use gdb to identify the line causing the error and describe how to fix it.

Question 3: Write a Program that takes command line arguments at most five arguments which are of type int, char, float and string. Your task is to identify the data type of each input given. (2 mark)

Example:

a. Arguments – asdf, 12345, Z, 3.14, 123sa
b. Output-
c. Integer- 12345
d. Char – Z
e. String- asdf
f. Float – 3.14
g. [Necessary Functions- strlen()]

1. HTML: Creating a Personal Portfolio Website

Task: Create a personal portfolio website using **only 1 HTML file** (can add CSS or Javascript using style and script tag in html file itself). The portfolio should contain the following **sections**:

- Header: Include your name, a tagline, and a navigation bar with links to sections.
- About Me: A short paragraph about yourself and an image with alt text.
- Skills: An unordered list of technical and soft skills.
- Projects: List at least three projects with title, description, and a link.
- Contact: Add contact details and a simple contact form.

Tags/Attributes to Study:

- *< header >, < nav >, < ul >, < li >, < a >, < h1 >, < p >, < img > , < section >, < br >, < form >, < input >, < button >< input >, < label >, < textarea >*
- Attributes: *href, src, alt, type, action, placeholder, class, id*

Your solution will be evaluated w.r.t HTML only.

2. Basic AWK Operations

Perform the following sub-tasks using AWK:

a) Installation of AWK

Install AWK on your system and verify the installation by printing the version.

b) Print First Field

Instruction: Create a file named users.txt with the following content:

Use AWK to print only the first field (usernames) from users.txt. The fields are separated by colons (:).

```
john.doe:password123:1001
jane.smith:qwerty:1002
alice.jones:abc123:1003
```

c) Sum Column Values

Instruction: Create a file named transactions.csv with the following content:

```
TransactionID,Amount,Date
T001,150.75,2022-01-15
T002,89.50,2022-01-16
T003,120.00,2022-01-17
```

Use AWK to sum up the values in the "Amount" column and print the total.

d) Filter Based on Field Value

Instruction: Create a file named inventory.txt with the following content:

Print all lines from inventory.txt where the quantity (third field) is less than

```
Item    Name    Quantity
101 Widget  15
102 Gadget  8
103 Doohickey   12
104 Thingamajig 5
```

10.

e) Count Number of Lines

Create a file named records.log with at least 20 lines of sample log entries. Use AWK to count and display the number of lines in records.log.

f) Find Maximum Value

Instruction: Create a file named metrics.dat with the following content:

```
Time    Metric1 Metric2 Metric3
10:00   45  30  25
10:05   50  35  40
10:10   55  25  45
```

Determine and print the maximum value in the fourth column (Metric3) of metrics.dat.

SAA102- Health Information and Sports-Part II

Course Code & Course Title:	SAA102- Health Information and Sports-Part II		
Course Type:	MNC		
Name of the programme(s):	SAA102 Health Information and Sports-Part II		
L – T – P	0-0-2	No. of Credits	0

1	**Course Objective:**

	a. To make the students understand the importance of doing regular physical activities and the effect of exercise on various physiological systems b. To provide information about the scientific principles of training and their implications in various games & sports c. To provide the basic information's about avoiding the injuries and it's management d. To make the students understand about the importance of physical activities & sports in managing the stress in day to day life e. To make students aware about the rules and regulation of different games & sports

2.	**Course Outcomes:**
CO1	The students will be able to design their own physical fitness training program
CO2	The students will be able understand how to handle their stress by participating in regular physical activities
CO3	The students will follow proper exercise pattern to avoid injuries
CO4	The students will understand how yoga helps to manage stress and improve their academic performance

3.	**Detailed Description of the Course**	
Topics	**CO(s) Addressed**	**Duration in weeks**
Periodization: Preparatory period, competition period and transitional period	CO1,CO2,CO3, CO4	8-12
Effects of exercise on various physiological systems	CO1,CO2,CO3, CO4	8-12
Therapeutic exercises & therapeutic modalities	CO1,CO2,CO3, CO4	8-12

The science of stress & it's yogic management	CO1,CO2,CO3, CO4	8-12

4.	Practical	
Topics	**CO(s) Addressed**	**Duration in weeks**
Practice of skills of major games like: Badminton, Table Tennis, Chess, Yoga, Basketball, Football, Handball, Cricket, Kho-Kho, Lawn Tennis, Throw ball, Athletics & Kabaddi	CO1,CO2,CO3,CO4	8-12
Participation in Intramural Sports Program	CO1,CO2,CO3,CO4	8-12
Preparation for Physical Efficiency Test Level-2	CO1,CO2,CO3,CO4	8-12

5	**Reference Books & other required materials**

i. Skot K Powers and Edward T Howley, Exercise Physiology Theory & application to fitness and performance , 10th Edition, Mc Graw Hill Education 2015

ii. Tudor O Bompa and G Gregory Haff, Periodization theory & methodology of training, 5th Edition, Human Kinetics 2009

iii. William E. Prentice, Therapeutic Modalities for sports medicine & athletic training,6th Edition, Mc Graw Hill Education 2009

6	**Evaluation Details: [Refer Table No. 5 of Academic Ordinances, Rules and Regulations]**
	Continuous evaluation Assessment- End Semester 100%