Department of Electrical& Electronics Engg.
GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR
(Established by State Legislature Act 17 of 1995)
'A+' Grade, NAAC Accredited

No. EEE/2025/539

Dated : 30/04/2025
12-5-25
1/5/25
D.S.(Acad)
AC

To

The Assistant Registrar (Academic),
GJUST, Hisar.

Sub: Scheme & Syllabus for B.Tech. (Electronics & Computer Engineering).

Please find enclosed herewith the Scheme and Syllabus for B.Tech. Electronics & Computer Engineering -2nd Year (3rd & 4th semester) along with minutes of Bos&R.

Enclosed: As above.

30/04/2025
Chairperson

Phone No. – 01662-263171 E-mail- eee@gjust.org.in

Department of Electrical & Electronics Engineering
Guru Jambheshwar University of Science & Technology, Hisar

Minutes of BOS meeting held on 17.01.2025 at 3:00 pm

A meeting of Post Graduate Board of Studies was held on 17.01.2025 at 3:00 pm (in blended mode) in chairperson office of EEE department. The following members were present:

1. Mrs. Suman Dahiya, Chairperson and Associate Professor, Deptt. of EEE, GJUS&T, Hisar.
2. Dr. Sandeep Arya, Professor, Deptt. of EEE, GJUS&T, Hisar.
3. Dr. Sanjeev Kumar Dhull, Professor, Deptt. of EEE, GJUS&T, Hisar
4. Dr. Deepak Kedia, Professor, Deptt. of EEE, GJUS&T, Hisar.
5. Dr. R.S. Yaduvanshi, Professor, Deptt. of ECE, NSUT, New Delhi. **(present online)**
6. Dr. Jagdish Kumar, Professor, Deptt. of EE, PEC, Chandigarh. **(present online)**
7. Dr. Priti Parbhakar, Associate Professor, Deptt. of EEE, GJUS&T, Hisar.
8. Dr. Ramnish, Associate Professor, Deptt. of EEE, GJUS&T, Hisar.
9. Er. Vikram Singh, Sr. Staff Engineer, ST MicroElectronics Pvt. Ltd., Greater Noida. **(present online)**
10. Manisha, Asstt. Professor, Deptt. of EEE, GJUS&T, Hisar.
11. Dr. Vinita, Asstt. Professor, Deptt. of EEE, GJUS&T, Hisar.

The items resolved & approved are us under:-

1. The Panel of Examiners for evaluation of Ph.D. Thesis of following candidates are drawn & approved by BoS&R and enclosed in a sealed envelope.

Sr. No.	Name of Scholar	Topic	Supervisor/Co-supervisor
1.	Ms. Vanita Reg. No. 170150080006	DESIGNING AND MODELING OF NANOSCALE GATE ALL AROUND MOSFET	Prof. Sandeep K Arya/ Dr. Rajiv Sharma
2.	Mr. Navin Kumar Reg. No. 200150090101	RISC-V based Reconfigurable Channel Coding Schemes for 5G and AIoT Applications.	Prof. Deepak Kedia/Dr. Gaurav Purohit

2. The BoS &R discussed and approved the minutes of DRC held on 18.12.2024 and 8.01.2025 including the request of one year extension of two students Ms. Anju (Reg No. 19015009005) and Ms. Anuja (Reg. No. 180150090006), request for discontinuation of co-supervisor of Ms. Nisha (Reg No. 210200090101) and progress report of scholars.

3. The BoS&R approved the complete scheme & Syllabi of second year of B.Tech. (Electronics & Computer Engineering) programme. Further, Bos&R authorised chairperson to make minor modifications if required.
4. The BoS&R discussed and approved the proposal of B.Tech Electrical Engineering (Evening) programme for working professionals. The BoS&R also approved the complete scheme & Syllabi of second year of the programme. Further, Bos&R authorised chairperson to make minor modifications if required.
5. The BoS&R discussed and approved the Pool of Minor Courses (MIC), Skill Enhancement Courses (SEC), Value Added Courses (VAC), Multi-disciplinary Courses (MDC) to be offered by the department for university Teaching Departments as per NEP-2020.
6. The Mission & Vision and PSO of E&C course were discussed and approved by the BoS&R. Further, Bos&R authorised chairperson to make minor modifications if required.
7. BoS&R authorised chairperson to approve the panel of examiner of theory courses for 2024-25 session if any left.

The BoS&R ended with the thanks to the chair.

17/01/2025
Mrs. Suman Dahiya
Chairperson, Deptt of EEE
GJUS&T Hisar

Prof. Sandeep Arya
Deptt EEE
GJUS&T Hisar

Prof. Sanjeev Kumar Dhull
Deptt EEE,
GJUS&T Hisar
17/1/25

Prof. Deepak Kedia
Deptt EEE,
GJUS&T Hisar

present online
Prof. R.S. Yaduvanshi,
Deptt ECE,
NSUT New Delhi

present online
Prof. Jagdish Kumar
Deptt of EE,
PEC, Chandigarh

Dr. Priti Parbhakar
Assoc. Prof., EEE Deptt.,
GJUS&T Hisar

17/01/25
Dr. Ranbish
Asso. Prof., Deptt EEE
GJUS&T Hisar

present online
Er. Vikram Singh
Sr. Staff Engineer,
ST MicroElectronics Pvt. Ltd.,
Greater Noida

Dr. Manisha
Asstt. Prof., EEE Deptt.,
GJUS&T Hisar

Dr. Vinita
Asst. Prof., Deptt EEE
GJUS&T Hisar

Department of Electrical & Electronics Engineering

The Curriculum Book

BACHELOR OF TECHNOLOGY

In

Electronics & Computer Engineering

4 YEARS PROGRAMME

Choice Based Credit System

(Syllabus Scheme: III to VIII Sem.)

(Detailed Syllabus: III-IV Sem.)

w. e. f. July-2025

Department of Electrical and Electronics Engineering
Guru Jambheshwar University of Science & Technology
Hisar, Haryana

Vision and Mission of the Department

Vision

To establish the department as a hub with the state of the art facilities to promote quality education, training, research and outreach activities in the field of Electrical, Electronics & Communication Engineering, Electronics & Computer Engineering and other related areas.

Mission

1. To produce quality students with passion for knowledge and creativity in the field of Electrical, Electronics & Communication engineering, Electronics & Computer Engineering.

2. To train the students community through continuously evolving education, training and research in order to achieve holistic development with conviction for social and technical ethics.

3. To facilitate and promote job oriented education in the emerging areas of Electrical, Electronics & Communication Engineering, and Electronics & Computer Engineering.

Program Specific Outcomes

Program Specific Outcomes (PSO)

At the end of the program, the student

PSO 1: Should be able to understand the concepts of Electronics & Computer engineering and their applications in the field of Semiconductor technology, Communication systems, Embedded systems, Computer Engineering, Networking, Software Programming and other relevant areas.

PSO 2: Should have an ability to apply technical knowledge and usage of modern hardware & software tools related to Electronics & Computer Engineering for solving real world problems.

PSO 3: Should have the capability to analyze, comprehend, design and develop electronic subsystems / systems and software for a variety of engineering applications and thus demonstrating professional ethics & concern for societal well-being.

Detailed Scheme

Electronics & Computer Engineering (ENC)

B.Tech., ENC - Total Credits	
Semester	**Credits**
1	17.5
2	20.5
3	22
4	16.5
5	22
6	20.5
7	24
8	17
Total	**160**

	Subject Area	Abbreviation	Credits
Electronics & Computer Engineering (ENC)	Humanities and Social Sciences including Management courses	HSMC	7
	Basic Science Courses	BSC	22
	Engineering Science Courses	ESC	19
	Professional Core Courses	PCC	74
	Program Elective Courses	PEC	17
	Open Elective Courses	OEC	9
	Project Work	PROJ	10
	Practical Training	PRT	2
	Mandatory Courses	MC	0(Non-Credit)
	Total Credits		**160**

* First Year Scheme & Syllabus is common for all students admitted in relevant branch in Engineering. The syllabus is already approved by First Year Coordinator at Faculty Level.
* Mandatory Courses syllabus is approved at university level.
* A separate booklet is provided by Dean, FET for open Elective course in respective semesters.

B.Tech. , ENC, Semester-3										
Course Code	Course Name	Teaching Schedule			Hours/ Week	Credits	Duration of Exam (Hrs)	Internal	External	Total Marks
		L	T	P						
BSC-ENC201-T	Discrete Mathematics	3	0	0	3	3	3	30	70	100
PCC-ENC203-T	Signal & System	3	0	0	3	3	3	30	70	100
PCC-ENC205-T	Digital Electronics	3	0	0	3	3	3	30	70	100
PCC-ENC207-T	Analog Electronics- I	3	0	0	3	3	3	30	70	100
PCC-ENC209-T	Object Oriented Programming System with C++	3	0	0	3	3	3	30	70	100
PCC-ENC211-T	Data Structure	3	0	0	3	3	3	30	70	100
PCC-ENC205-P	Digital Electronics Lab	0	0	2	2	1	3	50	50	100
PCC-ENC207-P	Analog Electronics- I Lab	0	0	2	2	1	3	50	50	100
PCC-ENC209-P	Object Oriented Programming System with C++ Lab	0	0	2	2	1	3	50	50	100
PCC-ENC211-P	Data Structure Lab	0	0	2	2	1	3	50	50	100
*MC103-T	Indian Constitution	3	0	0	3	0	3	30	70	100
Total		21	0	8	29	22	33	380	620	1000

*MC-Mandatory Course, which will be a non-credit course and the student has to get pass marks in order to qualify for the award of degree.

Note: Students will be allowed to use the scientific calculator only.

B.Tech. , ENC, Semester-4										
		Teaching Schedule				Credits	Duration of Exam (Hrs)	Internal	External	Total Marks
Course Code	Course Name	L	T	P	Hours/ Week					
ESC-ENC202-T	Engineering Circuit Analysis	3	0	0	3	3	3	30	70	100
PCC-ENC204-T	Embedded System	3	0	0	3	3	3	30	70	100
PCC-ENC206-T	Analog Electronics II	3	0	0	3	3	3	30	70	100
PCC-ENC208-T	Operating System	3	0	0	3	3	3	30	70	100
PCC-ENC204-P	Embedded System Lab	0	0	2	2	1	3	50	50	100
PCC-ENC206-P	Analog Electronics -II Lab	0	0	2	2	1	3	50	50	100
PCC-ENC208-P	Operating System Lab	0	0	2	2	1	3	50	50	100
PCC-ENC210-P	Skill & Innovation Lab	0	0	3	3	1.5	3	50	50	100
*MC104-T	Essence of Indian Traditional knowledge	3	0	0	3	0	3	30	70	100
**HSMC201-P	Human Values and Personality Development	0	0	3	3	0	3	50	50	100
Total		18	0	9	27	16.5	30	320	480	800

Note: The students will have to undergo Practical Training -I of 4 to 6 weeks duration during summer vacations, which will be evaluated in 5th sem. The practical training should preferably be done in offline mode. However, in case of online mode, the training must be done from reputed organisation with prior permission from the Chairperson/ T& P coordinator of the department.

*MC-Mandatory Course, which will be a non-credit course and the student has to get pass marks in order to qualify for the award of degree.

**HSMC201-T is a non-credit, qualifying course. The assessment will be completely internal.

Note: Students will be allowed to use the scientific calculator only.

B.Tech. , ENC, Semester-5										
Course Code	**Course Name**	**Teaching Schedule**			**Hours/ Week**	**Credits**	**Duration of Exam (Hrs)**	**Internal**	**External**	**Total Marks**
		L	**T**	**P**						
HSMC301-T	Fundamentals of Management for Engineers	2	0	0	2	2	3	30	70	100
PCC-ENC303-T	Analog & Digital Communication	3	0	0	3	3	3	30	70	100
PCC-ENC305-T	Database Management System	3	0	0	3	3	3	30	70	100
PCC-ENC307-T	Internet of Things	3	0	0	3	3	3	30	70	100
PCC-ENC309-T	VLSI Design	3	0	0	3	3	3	30	70	100
*Open Elective Course-I		3	0	0	3	3	3	30	70	100
PCC-ENC301-P	Simulation Lab	0	0	2	2	1	3	50	50	100
PCC-ENC305-P	Database Management System Lab	0	0	2	2	1	3	50	50	100
PCC-ENC307-P	Internet of Things Lab	0	0	2	2	1	3	50	50	100
PCC-ENC309-P	VLSI Design Lab	0	0	2	2	1	3	50	50	100
**PRT-ENC311-P	Practical Training-I Presentation	0	0	2	2	1	3	100	--	100
Total		17	0	10	27	22	33	480	620	1100

*The students will choose Open Elective Course-I offered by the Departments other than EEE.

**Assessment of Practical Training - I will be done internally and based on Presentation/seminar, viva-voce, report and certificate for the practical training taken at the end of 4th sem.

Note: Students will be allowed to use the scientific calculator only.

B.Tech. , ENC, Semester-6										
		Teaching Schedule			Hours/ Week	Credits	Duration of Exam (Hrs)	Internal	External	Total Marks
Course Code	Course Name	L	T	P						
HSMC302-T	Economics for Engineers	2	0	0	2	2	3	30	70	100
PCC-ENC304-T	Digital System Design	3	0	0	3	3	3	30	70	100
PCC-ENC306-T	Artificial Intelligence & Machine Learning	3	0	0	3	3	3	30	70	100
PCC-ENC308-T	Computer Networks	3	0	0	3	3	3	30	70	100
*PE-1		3	0	0	3	3	3	30	70	100
**Open Elective Course-2		3	0	0	3	3	3	30	70	100
PCC-ENC304-P	Digital System Design Lab	0	0	2	2	1	3	50	50	100
PCC-ENC306-P	Artificial Intelligence & Machine Learning Lab	0	0	2	2	1	3	50	50	100
PCC-ENC308-P	Mobile Application Development Lab	0	0	2	3	1.5	3	50	50	100
Total		17	0	6	24	20.5	27	330	570	900

Note: The students will have to undergo Practical Training -II of 4 to 6 weeks duration during summer vacations, which will be evaluated in 7th sem. The practical training should preferably be done in offline mode. However, in case of online mode, the training must be done from reputed organisation with prior permission from the Chairperson/ T& P coordinator of the department.

* Students will choose Program Elective-1 offered by the department

** The students will choose Open Elective Course-2 offered by the Departments other than EEE.

Note: Students will be allowed to use the scientific calculator only.

List of Program Electives: *PE-1

Course Code	Course Name
PEC-ENC-352-T	Microwave Engineering
PEC-ENC-354-T	Computer Architecture & Organisation
PEC-ENC-356-T	Electronic Measurement & Instrumentation
PEC-ENC-358-T	Linear Integrated Circuits & Applications
	Any Other MOOC/NPTEL/SWAYAM course (To be decided by the department at the beginning of the semester)

The student will choose 1 course from the list of Program Elective-1 at the beginning of the semester.
The chosen Program Elective will be offered as per university norms from time to time.

B.Tech. , ENC, Semester-7										
Course Code	**Course Name**	**Teaching Schedule**			**Hours/ Week**	**Credits**	**Duration of Exam (Hrs)**	**Internal**	**External**	**Total Marks**
		L	**T**	**P**						
PCC-ENC401-T	Digital Signal Processing	3	0	0	3	3	3	30	70	100
PCC-ENC403-T	Advanced Mobile Communication	3	0	0	3	3	3	30	70	100
PCC-ENC405-T	Neural Networks and Deep Learning	3	0	0	3	3	3	30	70	100
*PE-2		3	0	0	3	3	3	30	70	100
**Open Elective Course-3		3	0	0	3	3	3	30	70	100
PCC-ENC401-P	Digital Signal Processing Lab	0	0	2	2	1	3	50	50	100
PCC-ENC405-P	Neural Networks and Deep Learning Lab	0	0	2	2	1	3	50	50	100
PCC-ENC407-P	Programming with JAVA Lab	0	0	4	4	2	3	50	50	100
***PROJ-ENC413-P	Minor Project	0	0	8	8	4	3	50	50	100
****PRT-ENC415-P	Practical Training-II Presentation	0	0	2	2	1	3	100	--	100
*****MC-ENC417-P	General Proficiency	0	0	0	0	0	3	--	100	100
Total		15	0	18	33	24	33	450	650	1100

List of Program Electives: *PE-2

Course Code	**Course Name**
PEC-ENC-451-T	Big Data Analytics
PEC-ENC-453-T	Cyber Security
PEC-ENC-455-T	Compiler Design
PEC-ENC-457-T	Soft Computing
	Any Other MOOC/NPTEL/SWAYAM course (To be decided by the department at the beginning of the semester)

The student will choose 1 course from the list of Program Elective-2 at the beginning of the semester.

The chosen Program Elective will be offered as per university norms from time to time.

** The students will choose Open Elective Course-3 offered by the Departments other than EEE

*** The minor project will be completed and evaluated at the end of the 7th semester on the basis of its implementation, presentation, viva-voce and report. Minor project can be software/hardware/combination of hardware & software.

**** Assessment of Practical Training-II will be done internally based on presentation/seminar, viva-voce, report and certificate for the practical training taken at the end of 6th sem.

***** A viva related to General Proficiency of the students will be taken by external examiner and Chairperson of the Department (Internal Examiner) at the end of the semester.

*****MC-Mandatory Course which will be a non-credit course and the student has to get pass marks in order to qualify for the award of degree.

Note: Students will be allowed to use the scientific calculator only.

B.Tech. , ENC, Semester-8										
Course Code	**Course Name**	**Teaching Schedule**			**Hours/ Week**	**Credits**	**Duration of Exam (Hrs)**	**Internal**	**External**	**Total Marks**
		L	**T**	**P**						
Program Elective Course-3		3	0	0	3	3	3	30	70	100
Program Elective Course-4		3	0	0	3	3	3	30	70	100
Program Elective Course-5		3	0	0	3	3	3	30	70	100
Program Elective Course-4 Lab		0	0	2	2	1	3	50	50	100
Program Elective Course-5 Lab		0	0	2	2	1	3	50	50	100
*PROJ-ENC428-P	Major Project	0	0	12	12	6	3	50	50	100
Total		9	0	16	25	17	18	240	360	600

OR

**Course Code	**Course Name**	**Teaching Schedule**			**Hours/ Week**	**Credits**	**Duration of Exam (Hrs)**	**Internal**	**External**	**Total Marks**
		L	**T**	**P**						
ITR	Full Semester Industrial Training ENC-492P	--	--	--	--	11	--	80	80+240	400
Industrial training with any 2 Program Electives (Theory) taken from the above list		--	--	--	--	3+3	3	30+30	70+70	200
Total						17		140	460	600

Note: * The major project will be completed and evaluated at the end of the 8th semester on the basis of its implementation, presentation report and viva-voce as per the guidelines of the university. Major project can be software/hardware/combination of hardware & software.

** In case a student opts for Full Semester Industrial Training, it will be conducted as per University guidelines from time t time.

Students will be allowed to use the scientific calculator only.

List of Program Electives: PE -3

Course Code	Course Name
PEC-ENC-450-T	Control System
PEC-ENC-452-T	Satellite Communication
PEC-ENC-454-T	Introduction to Robotics
PEC-ENC-456-T	Software Engineering
	Any Other MOOC/NPTEL/SWAYAM course(To be decided by the department at the beginning of the semester)

List of Program Electives: PE- 4

Course Code	Course Name
PEC-ENC-460-T	Optical Communication
PEC-ENC-462-T	FPGA Design
PEC-ENC-464-T	Antenna Design
PEC-ENC-466-T	Drone Technology
PEC-ENC-468-T	System Verilog
PEC-ENC-460-P	Optical Communication lab
PEC-ENC-462-P	FPGA Design lab
PEC-ENC-464-P	Antenna Design Lab
PEC-ENC-466-P	Drone Technology Lab
PEC-ENC-468-P	System Verilog Lab
	Any Other MOOC/NPTEL/SWAYAM course (To be decided by the department at the beginning of the semester)

List of Program Electives: PE- 5

Course Code	Course Name
PEC-ENC-470-T	Digital Image Processing
PEC-ENC-472-T	Cloud Computing
PEC-ENC-474-T	Web Development
PEC-ENC-476-T	Data Analysis using R language
PEC-ENC-470-P	Digital Image Processing Lab
PEC-ENC-472-P	Cloud Computing Lab
PEC-ENC-474-P	Web Development Lab
PEC-ENC-476-P	Data Analysis using R language Lab
	Any Other MOOC/NPTEL/SWAYAM course (To be decided by the department at the beginning of the semester)

Detailed Syllabus

of

B.Tech. (Electronics & Computer Engineering)

3rd Semester

Discrete Mathematics
BSC-ENC201-T

General Course Information

Course Credits: 3 Mode: Lectures (L) Teaching schedule L T P : 3 0 0 Examination Duration:03 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. It is mandatory to appear in at-least two minor exams. Apart from minor examination, Class Performance will be measured through percentage of lectures attended (4 marks), Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of Pre-calculus and Algebra.

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	**Outline** various discrete structures and the related operations.	LOTS: L1 (Remember)
CO 2	**Illustrate** different discrete structures with the help of examples.	LOTS: L2 (Understand)
CO 3	**Apply** appropriate techniques to solve problems related to discrete structures	LOTS: L3 (Apply)
CO 4	**Analyse** the problem using set theory.	HOTS: L4 (Analyze)
CO 5	**Justify** the solutions with the help of proofs.	HOTS: L5 (evaluate)
CO 6	**Synthesise** diverse techniques related to discrete structures and optimization for solving real world problems and profitable solution for industries	HOTS: L6 (Create)

Course Contents

UNIT-1

Set Theory: Introduction to Set Theory, Venn Diagrams, Set Operations, Algebra of Sets, Duality, Finite, Infinite Sets and Counting Principle, Classes of Sets, Power Sets, Partitions, Multi Sets, Relations: Cartesian Product, Representation of Relations, Types of Relation, Equivalence Relations, Functions: Definition, Types of Functions, Composition of Functions, Inverse Function, Posets.

UNIT-II

Logic and Propositional Calculus: Introduction, Propositions and Compound Propositions, Basic Logical Operations, Propositions and Truth Tables, Tautologies and Contradictions, Logical Equivalence, Algebra of Propositions, Conditional and Bi-conditional Statements. Permutation, Combinations and Discrete Probability: Introduction, The rule of Sum and Product, Permutations, Combinations, Generation of Permutation and Combinations, Discrete Probability, Conditional Probability, Bayes' Theorem.

UNIT –III

Graphs Theory: Introduction to Graphs, Multi Graph, Directed and Undirected Graphs, Subgraphs, Bipartite Graphs, Regular Graphs, Connected Graphs, Homomorphic and Isomorphic Graphs, Cut points and Bridges, Paths and Circuits, Euler Graph, Hamiltonian Graph, Planar Graph, Euler Formula, Weighted Graphs, Dijkstra's Shortest Path Algorithm for Weighted Graphs, Trees, Spanning Trees, Minimum Spanning Tree (Prim's and Kruskal's Algorithm).

UNIT-IV

Recurrence Relation: Introduction, Recurrence Relations, Linear Recurrence Relations with Constant Coefficients, Homogeneous Solutions, Particular Solutions, Total Solutions, Solution by Method of Generating Functions.

Text and Reference Books:

1. S. Lipschutz and M. Lipson, *Discrete Mathematics*, Tata McGraw Hill, Third Edition.
2. C. L. Liu, *Elements of Discrete Mathematics*, Tata McGraw Hill, Fourth Edition.
3. Kenneth H. Rosen, *Discrete Mathematics and its applications*, Seventh Edition, Tata McGraw Hill.
4. B. Kolman, R. C. Busby and S. C. Ross, *Discrete Mathematical structures*, Sixth Edition, PHI.

Course Articulation Matrix:

CO-PO Matrix of Discrete Mathematics (BSC-ENC201-T)															
List of Course Outcomes	**Program Outcomes (PO)**												**Program Specific Outcomes (PSO)**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1: **Outline** various discrete structures and the related operations. **LOTS: L1 (Remember)**	3	2	3	1	2	-	-	-	-	3	-	2	3	3	2
CO 2: **Illustrate** different discrete structures with the help of examples. **LOTS: L2 (Understand)**	2	2	2	2	2	-	-	-	-	2	-	2	3	3	2
CO 3: **Apply** appropriate techniques to solve problems related to discrete structures **LOTS: L3 (Apply)**	3	3	2	3	3	-	-	-	-	2	-	3	3	3	2
CO 4: **Analyse** the problem using set theory. **HOTS: L4 (Analyze)**	2	3	2	2	2	-	-	-	-	1	-	3	3	2	3
CO 5 **Justify** the solutions with the help of proofs. **HOTS: L5 (Evaluate)**	3	2	1	2	2	-	-	-	-	1	-	3	3	2	3
CO 6: **Synthesise** diverse techniques related to discrete structures and optimization for solving real world problems and profitable solution for industries. **HOTS: L6 (Create)**	1	2	1	2	2	-	-	-	-	1	-	2	3	2	3

Signal & System
PCC-ENC203-T

General Course Information

Course Credits: 3 Mode: Lectures (L) Teaching schedule L T P : 3 0 0 Examination Duration:03 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. It is mandatory to appear in at-least two minor exams. Apart from minor examination, Class Performance will be measured through percentage of lectures attended (4 marks), Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Pre-requisites: Physics, Basics of Electrical Engineering

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	**Define** terminology and categorization related to signals, systems and transformation techniques.	LOTS: L1 (Remember)
CO 2	**Explain** properties of various signals & systems along with concept of conversion/transformation of signals like analog to digital conversion, time to frequency transformation.	LOTS: L2 (Understand)
CO 3	**Apply** signal properties and transformation techniques on various periodic/aperiodic, analog/discrete signals.	LOTS: L3 (Apply)
CO 4	**Analyse** LTI system response using transformation techniques.	HOTS: L4 (Analyze)
CO 5	**Evaluate** different types of signals and systems in different domains.	HOTS: L5 (Evaluate)
CO 6	**Compare** the properties of various signals and systems along with transformation techniques and their convergence region.	HOTS: L6 (Create)

Course Contents

UNIT-1

INTRODUCTION TO SIGNALS: Signal definition, classification of signals, basic/singularity continuous and discrete-time signals, basic operations: time shifting, time reversal, time scaling on signals, signal representation in terms of singular functions, correlation of signals and its properties, representation of a continuous-time signal by its samples: the sampling theorem, reconstruction, aliasing.

UNIT-II

SYSTEM & ITS PROPERTIES: System definition, classification of systems: linear & nonlinear systems; static & dynamic systems, causal & non-causal system, invertible & non-invertible, stable & unstable system, time variant & time invariant systems with examples, linear time-invariant systems: definition and properties, impulse response, convolution sum and its properties.

UNIT –III

FOURIER SERIES & FOURIER TRANSFORM: Introduction to Frequency domain Representation, Fourier Series Representation of Periodic Signals, Properties of Fourier Series, Fourier Transform for periodic and Aperiodic signals, Convergence of Fourier Transform, Properties of Fourier Transform, Applications of Fourier Transform.

DISCRETE-TIME FOURIER TRANSFORM: Fourier Transform representation for Discrete-Time Aperiodic & Periodic Signals, Properties of Discrete-Time Fourier Transform.

UNIT-IV

Z-TRANSFORM: Introduction to Z-Transform, Region of Convergence (ROC) for Z-Transform, Z-Transform Properties, Inverse Z-Transform, Analysis of LTI Systems Using Z-Transform, Application of Z transform.

TEXT BOOKS:

1. A. V. Oppenheim, A. S. Willsky, with S. Nawab "Signals & Systems", Prentice –Hall India.
2. Tarun K. Rawat, "Signal & Systems", Oxford University Press.
3. Farooq Husain, "Signals & Systems", Umesh Publications.

REFERENCE BOOKS:

1. S. Salivahanan, A. Vallavraj, C. Gnanapriya, "Digital Signal Processing", Tata McGraw Hill.
2. J. G. Proakis, D. G. Manolakis, "Digital Signal Processing, Principles, Algorithms, & Applications", Prentice-Hall India.
3. B. Kumar, "Signals and Systems", New Age International Publishers.

Course Articulation Matrix:

CO-PO Matrix of Signal & System (PCC-ENC203-T)															
List of Course Outcomes	**Program Outcomes (PO)**												**Program Specific Outcomes (PSO)**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1: **Define** terminology and categorization related to signals, systems and transformation techniques. **LOTS: L1 (Remember)**	3	3	2	1	1	-	-	-	-	1	-	1	3	2	2
CO 2: **Explain** properties of various signals & systems along with concept of conversion/transformation of signals like analog to digital conversion, time to frequency transformation. **LOTS: L2 (Understand)**	3	3	2	1	1	-	-	-	-	1	-	1	3	2	2
CO 3: **Apply** signal properties and transformation techniques on various periodic/aperiodic analog/discrete signals. **LOTS: L3 (Apply)**	3	3	2	1	1	-	-	-	-	1	-	1	3	2	2
CO 4: **Analyse** LTI system response using transformation techniques. **HOTS: L4 (Analyze)**	3	3	3	2	2	-	-	-	-	1	-	1	3	2	3
CO 5: **Evaluate** different types of signals and systems in different domains. **HOTS: L5 (Evaluate)**	3	3	2	1	2	-	-	-	-	1	-	1	3	2	3
CO 6: **Compare** the properties of various signals and systems along with transformation techniques and their convergence region. **HOTS: L6 (Create)**	3	3	2	1	2	-	-	-	-	1	-	1	3	2	3

Digital Electronics
PCC-ENC205-T

Course Credits: 3 Mode: Lectures (L) Teaching schedule L T P : 3 0 0 Examination Duration:03 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. It is mandatory to appear in at-least two minor exams. Apart from minor examination, Class Performance will be measured through percentage of lectures attended (4 marks), Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Pre-requisites: Basics of Electronics

Sr. No.	Course outcomes At the end of the course students will be able to:	RBT* Level
CO 1	**Outline** the general concepts of logical families and basic functioni of gates.	LOTS L1 (Remember)
CO 2	**Discuss** the basic digital components and their interconnections.	LOTS L2 (Understanding)
CO 3	**Apply** instructions for performing different circuit operations.	LOTS L3 (Applying)
CO 4	**Analyse** day to day problems and industrial problems for their solutions using digital circuits.	HOTS L4 (Analyse)
CO 5	**Contrast** different types of digital circuits and their designing methods.	HOTS L5 (Evaluate)
CO 6	**Design** digital circuit for various practical problems.	HOTS L6 (Create)

Course Contents
UNIT-I

Digital signal, logic gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra. Review of Number systems.

Binary codes: BCD, Excess-3, Gray, EBCDIC, ASCII, Binary arithmetics, Error detection and correction codes.

Karnaugh map and Quine Mcluskey methods of simplification.

UNIT -II

Combinational Circuit Design: Circuit design using gates, adder, subtractor, comparator, BCD to seven segment, code converters etc.

Design Using MSI Devices: Multiplexers and Demultiplexers and their use as logic elements, Decoders, Encoders, Adders / Subtractors, BCD arithmetic circuits

UNIT-III

Flip Flops: S-R, J-K, T, D, master-slave, edge triggered, flip flop conversions, Shift registers, bidirectional shift register, sequence generators, Ring counters and Johnson Counter, Design of Asynchronous and Synchronous Counters

Finite State Machines: Timing diagrams (synchronous FSMs), Moore versus Mealy, FSM design procedure- State diagram, State-transition table, State minimization, State encoding, Next-state logic minimization, Implement the design

UNIT-IV

Converters: D/A Convertors: Weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters.

A/D converters: Quantization, parallel -comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.

PLDs: ROM, PLA, PAL, FPGA and CPLDs, Implementation of combinational circuits using ROM, PLA and PAL

TEXT BOOK :

1. Modern Digital Electronics (Edition III) : R. P. Jain; TMH

REFERENCE BOOKS :

1. Digital Integrated Electronics : Taub & Schilling; MGH
2. Digital Principles and Applications : Malvino & Leach; McGraw Hill.
3. Digital Design : Morris Mano; PHI.

CO-PO Articulation Matrix

Course/Course Code: Digital Electronics (PCC-ENC205-T)															
List of Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1: Outline the general concepts of logical families and basic functioning of gates. **LOTS L1 (Remember)**	3	2	2	-	-	-	-	-	-	-	-	2	3	-	-
CO 2: Discuss the basic digital components ar their interconnections. **LOTS L2 (Understanding)**	3	2	2	-	-	-	-	-	-	-	-	2	3	-	-
CO 3: Apply instructions for performing different circuit operations. **LOTS L3 (Applying)**	3	2	-	-	-	-	-	-	-	-	-	2	3	1	-
CO 4: Analyze day to day problems and industrial problems for their solutions using digital circuits. **HOTS L4 (Analyse)**	3	3	2	-	-	3	-	-	-	-	-	3	3	2	3
CO 5: Contrast different types of digital circuits and their designing methods. **HOTS L5 (Evaluate)**	3	2	2	-	-	-	-	-	-	-	-	2	3	2	-
CO 6: Design digital circuit for various practical problems. **HOTS L6 (Create)**	3	-	-	-	-	3	-	3	-	-	2	-	-	2	2
Level of Attainments:															

Analog Electronics-I
PCC-ENC207-T

General Course Information

Course Credits: 3 Mode: Lectures (L) Teaching schedule L T P : 3 0 0 Examination Duration:03 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. It is mandatory to appear in at-least two minor exams. Apart from minor examination, Class Performance will be measured through percentage of lectures attended (4 marks), Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Pre-requisites: Physics, Basics of Electrical Engineering

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	**Describe** the terminology and fundamental principles related to Semiconductors and semiconductor devices.	LOTS: L1 (Remember)
CO 2	**Understand & explain** the working of various analog devices and circuits.	LOTS: L2 (Understand)
CO 3	**Apply** various models, methods / techniques to solve and synthesize related analog Circuits.	LOTS: L3 (Apply)
CO 4	**Analyze** the Analog devices and Circuits in terms of their parameters.	HOTS: L4 (Analyze)
CO 5	**Design** basic Analog Circuits for a given / desirable set of Circuit/Device parameters.	HOTS: L6 (Create)

Course Contents

UNIT-1

Semiconductors and PN junctions: Energy band structure in insulators, semiconductors and metals, intrinsic semiconductors, conductivity of semiconductors, extrinsic semiconductors, mass action law, charge densities in semiconductors with impurities, current flow in semiconductors: drift and diffusion current, PN junction structure and operation with open circuit Terminals, PN Junctions with an applied voltage, volt-ampere characteristics and their temperature dependence.

UNIT-II

Diodes and their applications : Half wave rectifier, full wave rectifier, bridge rectifier, rectifier with a filter capacitor, clippers, clampers, voltage doubler and voltage tripler, LED, IR diodes, Photodiodes, Zener diode and Zener diode as voltage regulator.

UNIT –III

BJT: Transistor construction, transistor action, Different operating conditions of a transistor, transistor current components, emitter efficiency, transport factor, current amplification factors and their relationship, base spreading resistance, transistor configurations and their characteristics: Common Base, Common Emitter, common collector, comparison, early effect and base width modulation, transistor as an amplifier, transistor as a switch, transistor breakdown, Frequency response of Common Emitter Amplifier.

UNIT-IV

Transistor Biasing and stabilization: need for biasing, AC and DC Load Line, selection of Operating Point, bias stabilization, stability factor, Voltage divider Bias, Collector to base bias, Bias compensation: thermistor and sensistor compensation, thermal runaway.
Regulated Power Supplies: Elements of regulated power supplies, Series voltage regulators, shunt voltage regulators, IC voltage regulators.

TEXT BOOKS:

1. Electronics devices and Circuits(4e): Millman, Halkias and Jit ; McGraw Hill
2. Microelectronics Circuits, theory and applications: Sedra & Smith; OXFORD
3. Electronics Devices & Circuits: Boylestad & Nashelsky ; Pearson
4. Electronics Devices and Circuits: J. B. Gupta, Katson

REFERENCE BOOKS:

1. Electronic circuit analysis and design (Second edition): D.A.Neamen; TMH.
2. Electronics Principles: Malvino ; McGrawHill
3. Electronics Circuits: Donald L. Schilling & Charles Belove ; McGrawHill

Course Articulation Matrix:

CO-PO Matrix of Analog Electronics-I (PCC-ENC207-T)															
List of Course Outcomes	**Program Outcomes (PO)**												**Program Specific Outcomes (PSO)**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1: Define & describe the terminology and fundamental principles related to Semiconductors and semiconductor devices. **LOTS: L1 (Remember)**	3	3	2	1	1	-	-	-	-	1	-	1	3	2	2
CO 2: Understand & explain the working of various analog devices and circuits. **LOTS: L2 (Understand)**	3	3	2	1	1	-	-	-	-	1	-	1	3	2	2
CO 3: Apply various models, methods / techniques to solve and synthesize related Analog Circuits. **LOTS: L3 (Apply)**	3	3	2	1	1	-	-	-	-	1	-	1	3	2	2
CO 4: Analyze the analog devices and Circuits in terms of their parameters. **HOTS: L4 (Analyze)**	3	3	3	2	2	-	-	-	-	1	-	1	3	2	3
CO 5: Design basic Analog Circuits for a given / desirable set of Circuit/Device parameters. **HOTS: L6 (Create)**	3	3	2	1	2	-	-	-	-	1	-	1	3	2	3

Object Oriented Programming System with C++
PCC-ENC209-T

General Course Information

Course Credits: 3 Mode: Lectures (L) Teaching schedule L T P : 3 0 0 Examination Duration:03 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. It is mandatory to appear in at-least two minor exams. Apart from minor examination, Class Performance will be measured through percentage of lectures attended (4 marks), Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Pre-requisites: Knowledge of computer fundamentals and problem solving using C programming

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	List the concepts related to object oriented paradigms.	LOTS: L1 (Remember)
CO 2	Distinguish between structured and object oriented approaches to programming.	LOTS: L2 (Understand)
CO 3	Apply object oriented constructs for problem solving.	LOTS: L3 (Apply)
CO 4	Detect logical and run time errors and suggest appropriate modifications.	HOTS: L4 (Analyze)
CO 5	Justify the design of a program for a given problem.	HOTS: L5 (evaluate)
CO 6	Design solutions to programming problems using multiple object oriented programming constructs together	HOTS: L6 (Create)

Course Contents
UNIT-1

Introduction to object oriented programming, C++ standard library, basics of a typical C++ environment, illustrative simple C++ programs, new features of ANSI C++ standard, OOPs concepts: Information hiding, encapsulation, data abstraction, access modifiers, controlling access to a class level, method, or variable (public, protected, private, block level, scope and mutable), other modifiers. Structure of class and struct in memory, accessing members of structures, Class scope and accessing class members, separating interface from implementation, pre-processors directives, macro programs, header files and namespaces, default constructors, chained constructor, default arguments with constructors, constant object and const member functions, object as member of class, use of destructors, virtual destructors, controlling access function and utility functions, function overloading.

UNIT-II

Inline function, friend function and friend classes, using this pointer, dynamic memory allocation with new and delete, static class members, proxy class, polymorphism concepts, overloading, overriding methods, abstract classes, reusability, class's behaviors, inheritance, base classes and derived classes, protected members, casting base-class pointers to derived-class pointers, using member functions, overriding base-class members in a derived-class, public, protected and private inheritance, using constructors and destructors in derived classes, implicit derived-class object to base- class object conversion, composition vs. inheritance.

UNIT –III

Virtual functions, abstract base classes and concrete classes, new classes and dynamic binding, virtual destructors, fundamentals of operator overloading, restrictions on operators overloading, operator functions as class members vs. as friend functions, overloading, <> overloading unary operators, overloading binary operators. I/O Streams, files handling, creating a sequential access file, reading data from a sequential access file, updating sequential access files, random access files, creating a random access file, writing data randomly to a random access file, reading data sequentially from a random access file.

UNIT-IV

Managing Console I/O, stream input/output classes and objects, stream output, stream input, unformatted I/O (with read and write), stream manipulators, stream format states, stream error states, exception handling, basics of C++ exception handling(try, throw, catch), rethrowing an exception, specific exception, processing unexpected exceptions, stack unwinding, exception handling in constructors and destructors, inheritance with exception introduction to generic classes, function templates, overloading template functions, class template, non-type parameters, templates and inheritance, templates and friends, templates and static members, container, iterator, algorithm and functional classes.

TEXT / REFERENCE BOOKS:

1. H. M. Deitel and P. J. Deitel, C++ How To Program, 6th Ed., Prentice Hall.
2. Robert Lafore, Object-Oriented Programming in C++, 3rd Ed., Sams Publishing.
3. D. Ravichandran, Programming with C++, 3rd Ed., T.M.H.
4. E. Balagurusamy, Object oriented Programming with C++, 6th Ed., Tata McGraw-Hill.
5. Horstmann, Computing Concepts with C++ Essentials, 3rd Ed., John Wiley.
6. Herbert Schildt , The Complete Reference in C++, 5th Ed., TMH.

Course Articulation Matrix:

CO-PO Matrix of Object Oriented Programming System with C++ (PCC-ENC209-T)															
List of Course Outcomes	**Program Outcomes (PO)**												**Program Specific Outcomes (PSO)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1. list the concepts related to object oriented paradigms. **(LOTS: Level 1: Remember)**	1	1	-	-	-	-	-	-	-	-	-	-	2	2	2
CO2. distinguish between structured and object oriented approaches to programming. **(LOTS: Level 2: Understand)**	1	1	-	-	-	-	-	-	-	-	-	-	3	3	2
CO3. Apply object oriented constructs for problem solving. **(LOTS: Level 3: Apply)**	2	1	-	2	-	-	-	-	-	-	-	-	3	2	2
CO4. Detect logical and run time errors and suggest appropriate modifications. **(HOTS: Level 4: Analyse)**	2	2	-	-	-	-	-	-	-	-	-	-	3	2	2
CO5. Justify the design of a program for a given problem. **(HOTS: Level 5: Evaluate)**	2	3	-	-	-	-	-	-	1	-	-	-	3	2	2
CO6. Design solutions to programming problems using multiple object oriented programming constructs together. **(HOTS: Level 6: Create)**	3	3	1	2	-	-	-	-	1	-	-	-	3	2	2

Data Structure
PCC-ENC211-T

General Course Information

Course Credits: 3 Mode: Lectures (L) Teaching schedule L T P : 3 0 0 Examination Duration:03 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. It is mandatory to appear in at-least two minor exams. Apart from minor examination, Class Performance will be measured through percentage of lectures attended (4 marks), Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Pre-requisites: Programming in C

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	**Define** fundamental concepts of data structures, including arrays, linked lists, stacks, queues, trees, and graphs.	LOTS: Level 1 Remember
CO 2	**Understand & explain** the characteristics, operations, and applications of various data structures and their relevance to problem-solving.	LOTS: Level 2 Understand
CO 3	**Demonstrate** the ability to implement and manipulate data structures like stacks, queues, linked lists, trees, and graphs in programming.	LOTS: Level 3 Apply
CO 4	**Analyze** the efficiency of different data structures and algorithms in terms of time and space complexity.	HOTS: Level 4 Analyze
CO 5	**Compare** the performance of various data structures and justify the choice of an appropriate data structure for solving a specific problem.	HOTS: Level 5 Evaluate

Course Contents

UNIT-1

Introduction to data structures and their types, Abstract data types, Linear lists: Arrays and linked lists: memory representations, implementing operations like traversing, searching, inserting and deleting etc. Applications of arrays and linked lists. Representing sets and polynomials using linked lists.

UNIT-II

Stack and Queue: Static and linked implementations, Operations and Applications. Circular queues, Tress, Binary trees and related terminology, Tree traversals (Recursive), Threaded Binary Trees, Binary Search Trees implementation and operations, Priority queues.

UNIT –III

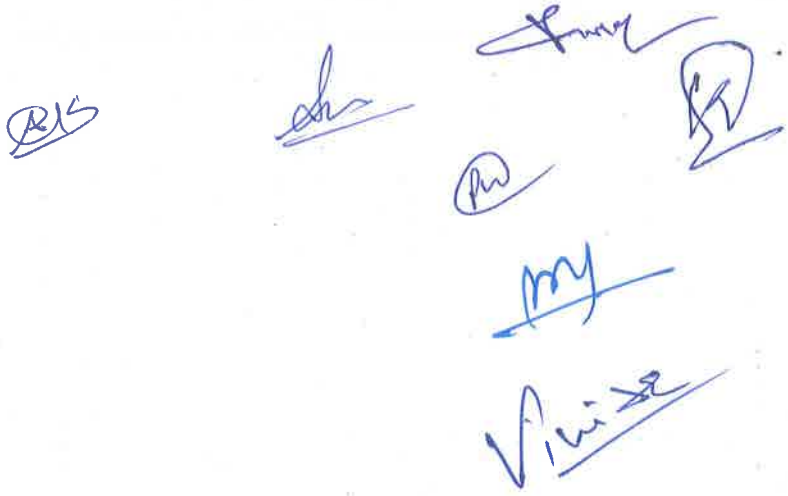
Height Balanced or AVL trees and B trees. Graph definitions and related terminology, memory representations and related operations (traversal, insertion, deletion, search), Path Matrix, Warshall's Shortest path algorithm Hashing, Hash tables, hash function and collision resolution.

UNIT-IV

Sequential and binary search, Sorting algorithms: Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort, Count sort, Heap sort, Comparison of searching and sorting techniques based on their complexity analysis, Time and space complexity of algorithms: Asymptotic analysis, Big O, Omega, Theta notations.

TEXT / REFERENCE BOOKS:

1. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "*Data Structures and Algorithms*", 1st Edition, Pearson.
2. Y. Langsam, M. J. Augenstein, A. M. Tenenbaum, "*Data Structures using C and C++*", 2nd edition, Pearson.
3. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "*Introduction to Algorithms*", 4th Edition, MIT Press, 2022.
4. R. Kruse, C. L. Tondo, B. Leung, and S. Mogalla, "*Data Structure and Program Design in C*", 2nd Edition, Pearson.
5. M. A. Weiss, "*Data Structures and Algorithm Analysis in C++*", 3rd Edition, Pearson Education India.
6. S. Sahni, "*Data Structures, Algorithms, and Applications in C++*", McGraw-Hill.



Course Articulation Matrix:

Data Structure (PCC-ENC211-T)															
List of Course Outcomes	**Program Outcomes (PO)**												**Program Specific Outcomes (PSO)**		
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1: Define fundamental concepts of data structures, including arrays, linked lists, stacks, queues, trees, and graphs. **LOTS: Level 1 (Remember)**	3	3	2	2	1	2	2	2	2	1	1	2	3	2	2
CO 2: Understand & explain the characteristics, operations, and applications of various data structures and their relevance to problem-solving. **LOTS: Level 2 (Understand)**	3	3	2	2	2	2	1	2	2	2	2	2	3	3	2
CO 3: Demonstrate the ability to implement and manipulate data structures like stacks, queues, linked lists, trees, and graphs in programming. **LOTS: Level 3 (Apply)**	3	3	2	2	1	2	2	1	2	2	2	2	3	2	2
CO 4: Analyze the efficiency of different data structures and algorithms in terms of time and space complexity. **HOTS: Level 4 (Analyze)**	3	3	3	2	1	2	2	1	2	1	3	2	3	3	3
CO 5: Compare the performance of various data structures and justify the choice of an appropriate data structure for solving a specific problem. **HOTS Level 5 (Evaluate)**	3	3	3	2	2	2	1	1	2	2	2	2	3	3	3
Level of Attainments:															

Digital Electronics Lab
PCC-ENC205-P

Course Credits: 1 Contact Hours: 2hrs/week/groups (L-T-P: 0-0-2) Mode: Lab Work Duration of Exam Hours:- 3 Hours	**Course Assessment Methods (Internal: 50; External: 50)** The internal and external assessment is based on the level of participation in laboratory sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the lab course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator / Internal Examiners/ External Examiners will maintain and submit the bifurcation of marks obtained by the students in their respective internal/external evaluations in the specified proformas (attached herewith as Annexures I and II) to the respective departments in addition to the submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.

Pre-requisites: Basic Electronics

Course Outcomes:

Sr. No.	Course outcomes At the end of the course students will be able to:	RBT* Level
CO 1	**Understand** experimental work and acquire sound technical knowledge to solve field problems of Digital Electronics.	LOTS: Levels 3 Apply
CO 2	**Analyze** parameters, characteristics and performance of the given digital components/ICs.	HOTS: Level 4 Analyse
CO 3	**Compare** the truth tables of proposed circuits with the desired practical expectations.	HOTS: Level 5 Evaluate

CO 4	**Integrate** knowledge for design of combinational and sequential circuits.	HOTS: Level 6 Create
CO 5	**Create** written records for the given experiments with problem definition, solution, observations & conclusion.	HOTS: Level 6 Create
CO 6	**Demonstrate** ethical practices while performing lab experiments individually or in the group.	LOTS: Level 3 Apply

LIST OF EXPERIMENTS:

1. Study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Realization of basic gates using Universal logic gates.
3. Design & realize a given function using K-maps and verify its performance.
4. Design and realize adder and subtractor circuits.
5. Design and realize comparator and parity generator circuits.
6. Design and realize 3 bit binary to gray code converter.
7. Implementation of multiplexer/encoder using logic gates.
8. Implementation and verification of Decoder/De-multiplexer
9. To verify the truth tables of S-R, J-K, T & D type flip flops.
10. Design a 4-bit shift-register and verify its operation.
11. To verify the operation of 4-bit asynchronous counters.
12. Design, and verify the 4-bit ring counter and twisted ring counter.
13. Mini Project. Implementation of any digital circuit on multipurpose board.

Note: At least eight experiments are to be performed in the semester, out of which at least six experiments should be performed from the given list. Remaining two experiments may either be performed from the list or designed & setup by the concerned Course Coordinator/department as per the scope of the syllabus.

CO-PO Articulation Matrix

Course/Course Code: Digital Electronics Lab (PCC-ENC205-P)															
List of Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1: **Understand** experimental work and acquire sound technical knowledge to solve field problems of Digital Electronics. **(LOTS: Levels 3 Apply)**	3	2	-	-	-	-	-	-	3	-	-	2	3	2	1
CO 2: **Analyze** parameters, characteristics and performance of the given digital components /ICs. **(HOTS: Level 4 Analyse)**	3	2	-	-	-	-	-	-	-	-	-	1	2	2	-
CO 3: **Compare** the truth tables of proposed circui with the desired practical expectations. **(HOTS: Level 5 Evaluate)**	3	2	-	-	-	2	-	-	-	-	-	2	-	1	-
CO 4: **Integrate** knowledge for design of combinational and sequential circuits **(HOTS: Level 6 Create)**	3	3	-	-	-	-	-	-	-	-	2	3	-	1	-
CO 5: **Create** written records for the given experiments with problem definition, solution, observations & conclusion. **(HOTS: Level 6 Create)**	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO 6: **Demonstrate** ethical practices while performing lab experiments individually or in th group. **(LOTS: Level 3 Apply)**	-	-	-	-	-	-	-	3	3	-	-	-	-	-	1
Level of Attainments:															

Analog Electronics-I Lab

PCC-ENC207-P

Course Credits: 1 Contact Hours: 2hrs/week/groups (L-T-P: 0-0-2) Mode: Lab Work Duration of Exam Hours:- 03 Hours	**Course Assessment Methods (Internal: 50; External: 50)** The internal and external assessment is based on the level of participation in laboratory sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the lab course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator / Internal Examiners/ External Examiners will maintain and submit the bifurcation of marks obtained by the students in their respective internal/external evaluations in the specified proformas (attached herewith as Annexures I and II) to the respective departments in addition to the submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.

Course Outcomes

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	**Examine** the characteristics of various electronic devices and circuits.	LOTS: L3 (Apply)
CO 2	**Analyze & Evaluate** the analog devices and circuits in terms of their performance parameters.	HOTS: L4 & L5 (Analyze and Evaluate)
CO 3	**Design** analog circuits for a given set of parameters for some applications.	HOTS: L6(Create)
CO 4	**Create** written records for the given experiments with problem definition, solution, observation and conclusion.	HOTS: L6(Create)
CO 5	**Demonstrate** ethical practices while performing lab experiments individually or in groups.	LOTS: L3(Apply)

List of Experiments

1. To study and verify V-I characteristics of P N junction diode.
2. To study and verify V-I characteristics of Zener diode.
3. To study and verify the characteristics of half wave rectifier with capacitor filter circuit.
4. To study and verify the characteristics of full wave rectifiers with capacitor filter circuit.
5. To design clipper circuit using diodes and observe their output waveforms.
6. To design the clamper circuit using diodes and observe their output waveforms.
7. To design the voltage doubler circuit.
8. To study and verify the characteristics of Common Base configurations of a transistor.
9. To study and verify the characteristics of Common Emitter configurations of a transistor.
10. To study and verify the characteristics of Common Collector configurations of a transistor.
11. To design a series voltage regulator circuit and verify its output.
12. To design a shunt Voltage regulator circuit and verify its output.
13. To design IC voltage regulator circuit and verify its output.
14. Project (Any topic related to the scope of the course).

Note: At least 10 experiments are to be performed in the semester, out of which minimum 7 experiments should be performed from above list. Remaining experiments may either be performed from the above list or designed and set by concerned Course Coordinator/department as per the scope of the syllabus.

Course Articulation Matrix:

CO-PO Articulation Matrix: Analog Electronics-I Lab (PCC-ENC207-P)															
List of Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1:Examine the characteristics of various electronic devices and circuits. **LOTS: L3 (Apply)**	3	2	3	2	2	3	1	2	2	2	2	2	3	2	2
CO 2: Analyze & Evaluate the analog devices and circuits in terms of their performance parameters. **HOTS: L4 & L5 (Analyze and Evaluate)**	2	2	2	2	2	3	1	-	3	2	3	2	3	3	3
CO 3:Design analog circuits for a given set of parameters for some applications. **HOTS: L6(Create)**	2	2	2	2	3	3	1	-	3	3	3	2	2	2	3
CO 4:Create written records for the given experiments with problem definition, solution, observation and conclusion. **HOTS: L6(Create)**	2	2	2	2	2	3	1	-	3	2	2	2	3	3	3
CO 5: Demonstrate ethical practices while performing lab experiments individually or in the group. **LOTS: L3 (Apply)**	3	2	3	2	2	3	2	-	3	2	2	2	3	3	2
Level of Attainments:															

Object Oriented Programming System with C++ Lab

PCC-ENC209-P

General Course Information

Course Credits: 1 Contact Hours: 2hrs/week/groups (L-T-P: 0-0-2) Mode: Lab Work Duration of Exam Hours 3 Hours	**Course Assessment Methods (Internal: 50; External: 50)** The internal and external assessment is based on the level of participation in laboratory sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the lab course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator / Internal Examiners/ External Examiners will maintain and submit the bifurcation of marks obtained by the students in their respective internal/external evaluations in the specified proformas (attached herewith as Annexures I and II) to the respective departments in addition to the submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.

Pre-requisites: Programming for Problem solving using C.

S. No.	Course Outcomes: At the end of the semester, students will be able to:	RBT Level
CO 1	Implement problems with object oriented framework.	LOTS: L3 (Apply)
CO 2	Analyse the structure of programs for modular design.	HOTS: L4 (Analyse)
CO 3	Evaluate robustness of a program by testing it on test/use cases.	HOTS: L5 (Evaluate)
CO 4	Design class hierarchies for implementing inheritance/polymorphism	HOTS: L6 (Create)
CO 5	Create a lab record of assignments including problem definitions, design of solutions and conclusions.	HOTS: L6 (Create)
CO 6	Demonstrate ethical practices and solve problems individually or in a group.	LOTS: L3 (Apply)

List of Experiments/ assignments

1. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results maybe a DM object or DB objects, depending on the units in which the result is required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

2. Create a class rational which represents a numerical value by two double values- NUMERATOR & DENOMINATOR. Include the following public member Functions:

- constructor with no arguments (default).
- constructor with two arguments.
- void reduce () that reduces the rational number by eliminating the highest common factor between
- the numerator and denominator.
- Overload + operator to add two rational number.
- Overload >> operator to enable input through cin.
- Overload << operator to enable output through cout.

Write the main () function to test all the functions in the class.

3. A hospital wants to create a database regarding its indoor patients. The information to be stored includes

a) Name of the patient
b) Date of admission
c) Disease
d) Date of discharge

Create a structure to store the date (year, month and day as its members). Create a base class to store the above information. The member function should include functions to enter information and display a list of all the patients in the database. Create a derived class to store the age of the patients. List the information about all the pediatric patients (less than twelve years in age).

4. Make a class Employee with a name and salary. Make a class Manager inherited from Employee. Add an instance variable named department of type string. Supply a method to to String that prints the manager's name, department and salary. Make a class Executive inherited from Manager. Supply a method to String that prints the string "Executive" followed by the information stored in the Manager super class object. Supply a test program that tests these classes and methods.

5. Imagine a tollbooth with a class called 'toll Booth'. The two data items are of type unsigned int to hold the total number of cars, and a type double to hold the total amount of money collected. A constructor initializes both to 0. A member function called 'payingCar()' increments the car total and adds 0.50 to the cash total. Another function, called 'nopayCar ()', increments the car total but adds nothing to the cash total. Finally, a member function called displays the two totals. Include a program to test this class. This program should allow the user to push one key to count a paying car, and another to count a nonpaying car. Pushing the ESC kay should cause the program to print out the total cars and total cash and then exit.

6. Write a function called 'revers_it()' that reverses a string (an array of char). Use a for loop that swaps the first and last characters, then the second and next to last characters and so on. The string should be passed to 'revers_it ()' as an argument. Write a program to exercise 'revers_it ()'. The program should get a string from the user call of' revers_it () function and print out the result. Use an input method that allows embedded blanks. Test the program with phrase, "Guru Jambheshwar University of Science & Technology, Hisar".

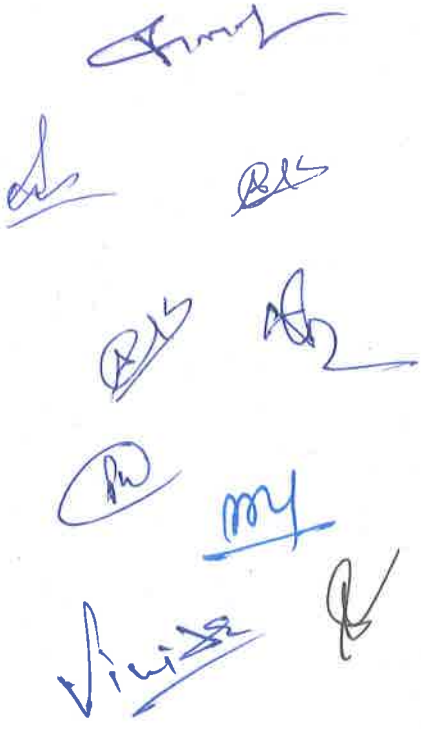
7. Write a program related to file handling with all the exception handling provisions.

8. C++ program to write and read time in/from binary file using fstream. Use exception handling wherever possible.

9. Write a program to implement string class using STL.

10. Write a program to implement run time polymorphism.

Note: At least eight Assignments/experiments are to be performed in the semester, out of which atleast six experiments should be performed from above list. Remaining experiments may either be performed from the above list or designed & set by the concerned course coordinator/institution as per the scope of the syllabus.



CO-PO Articulation Matrix:

CO-PO Articulation Matrix: Object Oriented Programming System with C++ Lab (PCC-ENC209-P)															
List of Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1: Implement problems with object oriented framework. (LOTS: Level 3: Apply)	2	2	-	-	1	-	-	-	2	-	-	2	3	2	2
CO 2: Analyse the structure of programs for modular design. (HOTS: Level 4: Analyse)	2	2	-	-	2	-	-	-	-	-	-	-	3	3	2
CO 3: Evaluate robustness of a program by testing it on test/use cases. (HOTS: Level 5: Evaluate)	2	2	-	-	2	-	-	-	-	-	-	-	3	2	2
CO 4: Design class hierarchies for implementing inheritance/polymorphism. (HOTS: Level 6: Create)	3	-	1		2	-	-	-	-	-	-	2	3	2	3
CO 5: Create a lab record of assignments including problem definitions, design of solutions and conclusions. (HOTS: Level 6: Create)	-	-	-	-	-	-	-	-	-	3	-	-	2	2	2
CO 6: Demonstrate ethical practices and solve problems individually or in a group. (LOTS: Level 3: Apply)	-	-	-	-	-	-	-	3	3	-	-	3	2	3	2
Level of Attainments:															

Data Structure Lab

PCC-ENC211-P

General Course Information

Course Credits: 1 Contact Hours: 2hrs/week/groups (L-T-P: 0-0-2) Mode: Lab Work	**Course Assessment Methods (Internal: 50; External: 50)** The internal and external assessment is based on the level of participation in laboratory sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the lab course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator / Internal Examiners/ External Examiners will maintain and submit the bifurcation of marks obtained by the students in their respective internal/external evaluations in the specified proformas (attached herewith as Annexures I and II) to the respective departments in addition to the submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.

Pre-requisites: Programming in C Language

Sr. No.	Course Outcomes: At the end of the semester, students will be able to:	RBT Level
CO 1	**Implement** basic data structures such as linked lists, stacks, and queues using a high-level programming language.	LOTS: L3 (Apply)
CO 2	**Analyze** and **compare** the efficiency of algorithms for different data structures in terms of time and space complexity.	HOTS: L4 (Analyze)
CO 3	**Evaluate** and select the most appropriate data structure for solving a given problem based on efficiency and requirements.	HOTS: L5 (Evaluate)
CO 4	**Design** and **develop** programs using advanced data structures, such as trees and graphs, to solve complex real-world problems.	HOTS: L6 (Create)
CO 5	**Demonstrate** ethical practices while performing lab experiments individually or in the group.	LOTS: Level 3 (Apply)

LIST OF EXPERIMENTS

1. Perform insertion, deletion, and traversal operations on arrays.
2. Implement linear and binary search algorithms on arrays.
3. Implement bubble sort, insertion sort, and selection sort algorithms.
4. Perform stack operations (push, pop, peek) using arrays.
5. Implement queue operations (enqueue, dequeue, peek) using arrays.
6. Perform insertion, deletion, and traversal operations on singly linked lists.
7. Implement doubly linked list operations (insertion, deletion, traversal).
8. Implement stack operations using a singly linked list.
9. Implement queue operations using a singly linked list.
10. Write a program to reverse a linked list.
11. Implement a binary search tree (BST) with insertion, deletion, and traversal operations.
12. Perform depth-first search (DFS) and breadth-first search (BFS) on a graph.
13. Implement a hash table using chaining and linear probing techniques.
14. Create a max-heap or min-heap and perform heap sort.
15. Implement Dijkstra's algorithm to find the shortest path in a weighted graph.

Note: At least eight experiments are to be performed in the semester, out of which atleast six experiments should be performed from above list. Remaining experiments may either be performed from the above list or designed & set by the concerned course coordinator/institution as per the scope of the syllabus.

CO-PO Articulation Matrix: Data Structure Lab (PCC-ENC211-P)															
List of Course Outcomes	**Program Outcomes (PO)**												**Program Specific Outcomes (PSO)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1: Implement basic data structures such as linked lists, stacks, and queues using a high-level programming language. LOTS: L3 (Apply)	3	1	1	-	1	1	-	1	2	-	-	1	3	2	1
CO 2: Analyze and **compare** the efficiency of algorithms for different data structures in terms of time and space complexity. HOTS: L4 (Analyze)	2	2	1	-	1	1	-	1	2	-	-	1	3	2	1
CO 3: Evaluate and select the most appropriate data structure for solving a given problem based on efficiency and requirements. HOTS: L5 (Evaluate)	2	1	2	-	1	1	-	1	2	-	-	1	2	2	2
CO 4: Design and **develop** programs using advanced data structures, such as trees and graphs, to solve complex real-world problems. HOTS: L6 (Create)	2	1	3	1	2	2	1	2	3	-	1	2	3	2	3
CO 5: Demonstrate ethical practices while performing lab experiments individually or in the group. LOTS: Level 3 (Apply)	-	-	-	-	-	-	-	2	1	3	-	2	-	-	-
Level of Attainment:															

Course code	**MC103-T**				
Category	**Mandatory Courses**				
Course title	**Indian Constitution**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	
	3	**0**	**0**	**0.0**	
Pre-requisites (if any)	-				
Course Assessment Methods (Internal: 30; External: 70)	**Internal examination:** • **Two minor tests each of 20 marks** • **Class Performance measured through percentage of lectures attended (4 marks)** • **Assignments, quiz etc. (6 marks)** **End semester examination:** • **Nine questions are to be set by the examiner.** • **Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions.** • **Rest of the eight questions is to be set with a fair weightage of all the units.** • **All questions will carry equal marks.** • **The Students will be required to attempt 05 questions in all.**				

Course Contents- Basic features and fundamental principles

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

Detailed Syllabus

of

B.Tech. (Electronics & Computer Engineering)

4th Semester

Engineering Circuit Analysis
ESC-ENC202-T

General Course Information

Course Credits: 3 Mode: Lectures (L) Teaching schedule L T P : 3 0 0 Examination Duration:03 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. It is mandatory to appear in at-least two minor exams. Apart from minor examination, Class Performance will be measured through percentage of lectures attended (4 marks), Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Pre-requisites: Mathematics, Physics, Electrical Technology

Sr. No.	Course Outcomes At the end of the semester, students will be able to:	RBT Level
CO 1	**Describe** the terminology and fundamental principles related to electric networks and their representation.	LOTS: Level 1 Remember
CO 2	**Understand & explain** various theorems and methods / techniques for representation and analysis of electric networks.	LOTS: Level 2 Understand
CO 3	**Apply** time domain approach, Laplace transform and network parameters to solve and synthesize various electric networks.	LOTS: Level 3 Apply
CO 4	**Analyze & evaluate** the electric networks including filters in terms of their realizability, time and frequency domain behavior and stability.	HOTS: Level 4 & 5 Analyze & Evaluate
CO 5	**Design** basic electric networks for a given / desirable set of network parameters.	HOTS: Level 6 Create

Course Contents

UNIT-I

TIME DOMAIN ANALYSIS OF LINEAR CIRCUITS: Initial Conditions of resistive, inductive & capacitive Elements; Transient & Steady state Response of RC, RL and RLC Circuits having DC / Step excitation. Use of time domain approach in solving electrical networks.

UNIT-II

LAPLACE TRANSFORM AND ITS APPLICATION IN CIRCUIT ANALYSIS: Introduction to Laplace transform & its properties, Laplace transform of special signal waveforms, Inverse Laplace transform, Partial fraction expansion, Initial and Final value theorems, Use of Laplace Transform in solving electrical networks.

UNIT-III

TWO PORT NETWORKS ANALYSIS: Classification of network, Short-circuit Admittance parameters, Open circuit impedance parameters, Transmission parameters, Hybrid parameters, Inter-relationships between parameter sets, Input and Output Impedances in terms of two port parameters, Inter-connections of two port networks.

UNIT-IV

FILTERS: Introduction to filters, Characteristics of filters, Filter Classification, Passive Filters: Analysis & Design of prototype HPF, LPF, BPF, & BSF; m-derived filters: Theory and Analysis of m-derived low pass and high pass filters; Active Filters: Characteristics, Realization of Active LPF, HPF, BPF & BSF using Operational Amplifier.

TEXT/ REFERENCE BOOKS:

1. Circuit Theory: A Chakrabarty; Dhanpat Rai & Co. (Pvt.) Ltd..
2. Network Analysis: Van Valkenburg; Pearson Education.
3. Engineering Circuit Analysis: W H Hayt, Kemmerly, Durbin; McGraw Hill Publication
4. Electric Circuits and Networks: K.S. Suresh Kumar; Pearson Education.

Course Articulation Matrix:

Engineering Circuit Analysis (ESC-ENC202-T)															
List of Course Outcomes	**Program Outcomes (PO)**												**Program Specific Outcomes (PSO)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1: Describe the terminology and fundamental principles related to electric networks and their representation. **LOTS: Level 1 (Remember)**	3	1	1	-	-	1	1	-	-	-	-	2	3	-	-
CO 2: Understand & explain various theorems and methods / techniques for representation and analysis of electric networks. **LOTS: Level 2 (Understand)**	3	2	2	-	-	-	-	-	-	1	-	2	3	-	-
CO 3: Apply time domain approach, Laplace transform and network parameters to solve and synthesize various electric networks. **LOTS: Level 3 (Apply)**	3	3	3	-	2	-	-	-	-	-	-	2	3	2	3
CO 4: Analyze & evaluate the electric networks including filters in terms of their realizability, time and frequency domain behavior and stability. **HOTS: Level 4 & 5 (Analyze & Evaluate)**	3	3	3	-	-	1	1	-	1	-	-	3	3	2	3
CO 5: Design basic electric networks for a given / desirable set of network parameters. **HOTS Level 6 (Create)**	3	2	3	-	-	2	2	2	2	1	1	3	3	2	3
Level of Attainments:															

Embedded System
PCC-ENC204-T

General Course Information

Course Credits: 3 Mode: Lectures (L) Teaching schedule L T P : 3 0 0 Examination Duration:03 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. It is mandatory to appear in at-least two minor exams. Apart from minor examination, Class Performance will be measured through percentage of lectures attended (4 marks), Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Pre-requisites: Digital Electronics & Analog Electronics

Sr. No.	At the end of the semester, students will be able:	RBT Level
CO 1	**Outline** the architecture of PIC microcontroller & Arduino.	LOTS: Level 1 Remember
CO 2	**Explain** various kinds of instruction sets of PIC microcontroller & Arduino.	LOTS: Level 2 Understand
CO 3	**Apply** knowledge of architecture & instruction set in writing assembly language programs.	LOTS: Level 3 Apply
CO 4	**Analyze & evaluate** various microcontroller based circuits.	HOTS: Level 4 & 5 Analyze & evaluate
CO 5	**Design and develop** an embedded system for different applications.	HOTS: Level 6 Create

Course Contents

UNIT-1

Introduction to PIC Microcontrollers: Comparison between PIC16 (mid range 8 bits family) and PIC18 (advanced 8 bits family) families of microcontrollers.

PIC Architecture: Pin Diagram, Functional Block diagram, Program Memory Organization, Special Function Registers and Data Memory Organization, Special function registers & general purpose registers.

UNIT-II

Timers & Interrupts in PIC: Timer 0 Module, Timer 0 as counter; Block Diagram of Timer1 Module; Timer1 as synchronous and Asynchronous counter; Timer1 Oscillator; Block Diagram of Timer2 Module; Interrupt logic diagram, Timer0 Interrupt, Timer1 and Timer2 Interrupts and External interrupts, Watchdog timer, Interrupt Service Routine

UNIT –III

Instruction set & Programming in PIC: Assembly Language Programming Style and Instruction set (PIC 16F877A), Introduction to IDEs for PIC programming, Simple Arithmetic & logical operations; Interfacing with LCD, Stepper Motor.

UNIT-IV

Arduino Simulation Environment: Introduction to Arduino, Arduino Uno architecture, Programming with Arduino Uno IDE: Understanding the Arduino syntax, Interfacing of various sensors with Arduino Uno: LED, Temperature sensor, Ultrasonic Sensor, LCD.

TEXT/REFERENCE BOOKS:

1. Design with PIC Microcontroller, by John Peatman, Pearson.
2. Getting Started with Arduino, by Massimo Banzi and Michael Shiloh, Maker Media.
3. PIC Microcontroller and Embedded Systems: using assembly and C for PIC 18, by Muhammad Ali Mazidi, Pearson.
4. Arduino Project Books, www.arduino.cc

Course Articulation Matrix:

Embedded System (PCC-ENC204-T)															
List of Course Outcomes	**Program Outcomes (PO)**												**Program Specific Outcomes (PSO)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1: **Outline** the architecture of PIC microcontroller & Arduino. **LOTS: Level 1 (Remember)**	3	3	2	2	1	2	2	2	2	1	1	2	3	2	2
CO 2: **Explain** various kinds of instruction sets of PIC microcontroller & Arduino. **LOTS: Level 2 (Understand)**	3	3	2	2	2	2	1	2	2	2	2	2	3	3	2
CO 3: **Apply** knowledge of architecture & instruction set in writing assembly language programs. **LOTS: Level 3 (Apply)**	3	3	2	2	1	2	2	1	2	2	2	2	3	2	2
CO 4: **Analyze & evaluate** various microcontroller based circuits. **HOTS: Level 4 & 5 (Analyze & Evaluate)**	3	3	3	2	1	2	2	1	2	1	3	2	3	3	3
CO 5: **Design and develop** an embedded system for different applications. **HOTS: Level 6 (Create)**	2	2	3	3	2	3	1	1	2	3	3	3	3	3	3

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Analog Electronics-II
PCC-ENC206-T

General Course Information

Course Credits: 3 Mode: Lectures (L) Teaching schedule L T P : 3 0 0 Examination Duration:03 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. It is mandatory to appear in at-least two minor exams. Apart from minor examination, Class Performance will be measured through percentage of lectures attended (4 marks), Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Pre-requisites: Physics, Analog Electronics-I, Basics of Electrical Engineering

Sr. No.	Course Outcomes At the end of the semester, students will be able:	RBT Level
CO 1	**Define & describe** the terminology and fundamental principles related to FET, oscillators, and amplifiers.	LOTS: L1 (Remember)
CO 2	**Understand & explain** the working of various semiconductor devices and analog circuits.	LOTS: L2 (Understand)
CO 3	**Apply** various models, methods / techniques to solve and synthesize Analog Circuits.	LOTS: L3 (Apply)
CO 4	**Analyze & evaluate** the Analog devices and Circuits in terms of their parameters.	HOTS: L4 (Analyze)
CO 5	**Design** Analog Circuits for a given / desirable set of Circuit/Device parameters.	HOTS: L5 (evaluate)

Course Contents

UNIT-I

FET: Introduction, construction and characteristics of JFET, transfer characteristics, comparison of BJT and FET, Depletion MOSFET construction and characteristics, Enhancement MOSFET construction and characteristics, MESFET, comparison NMOS and PMOS, comparison of JFET and MOSFET, CMOS, MOS resistor, MOS capacitor.

UNIT-II

FET Biasing and amplifiers: source self bias, biasing for zero current drift, biasing the enhancement MOSFET, FET as voltage variable resistor, Introduction to FET amplifiers, FET small signal model, common source amplifier, common drain amplifier, A generalized FET amplifier.

UNIT –III

Output Stages and Power Amplifiers: Classification of Output Stages-Class A, B, and C operations; Class A large signal amplifiers, Second and higher order harmonic distortion, efficiency, transformer coupled power amplifier, Class B amplifier: efficiency & distortion, push-pull amplifiers, Class C amplifier, class AB operation.

UNIT-IV

Feedback Amplifiers: Classification of amplifiers, Feedback concept, transfer gain with feedback, general characteristics of negative feedback amplifiers, effect of negative feedback on input and output resistance, voltage series feedback, current series feedback, current shunt feedback, voltage shunt feedback.
OSCILLATORS: General form of oscillator circuit Barkhausen criteria, R-C phase shift oscillator, Hartley oscillator, Colpitts oscillator, wien-bridge oscillator, crystal oscillator

TEXT BOOKS:

1. Electronics devices and Circuits(4e): Millman, Halkias and Jit ; McGraw Hill
2. Microelectronics Circuits, theory and applications: Sedra & Smith; OXFORD
3. Electronics Devices & Circuits: Boylestad & Nashelsky ; Pearson
4. Electronics Devices and Circuits: J. B. Gupta, Katson

REFERENCE BOOKS:

1. Electronic circuit analysis and design (Second edition): D.A.Neamen; TMH.
2. Electronics Principles: Malvino ; McGrawHill
3. Electronics Circuits: Donald L. Schilling & Charles Belove ; McGrawHill

Course Articulation Matrix:

CO-PO Matrix of Analog Electronics-II (PCC-ENC206-T)															
List of Course Outcomes	**Program Outcomes (PO)**												**Program Specific Outcomes (PSO)**		
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1: Define & describe the terminology and fundamental principles related to FET, oscillators, and amplifiers. LOTS: L1 (Remember)	3	3	2	1	1	-	-	-	-	1	-	1	3	2	2
CO 2: Understand & explain the working of various semiconductor devices and analog circuits. LOTS: L2 (Understand)	3	3	2	1	1	-	-	-	-	1	-	1	3	2	2
CO 3: Apply various models, methods / techniques to solve and synthesize Analog Circuits. LOTS: L3 (Apply)	3	3	2	1	1	-	-	-	-	1	-	1	3	2	2
CO 4: Analyze & evaluate the Analog devices and Circuits in terms of their parameters. HOTS: L4 (Analyze)	3	3	3	2	2	-	-	-	-	1	-	1	3	2	3
CO 5: Design Analog Circuits for a given / desirable set of Circuit/Device parameters. HOTS: L5 (evaluate)	3	3	2	1	2	-	-	-	-	1	-	1	3	2	3
Level of Attainment:															

Operating System
PCC-ENC208-T

General Course Information

Course Credits: 3 Mode: Lectures (L) Teaching schedule L T P : 3 0 0 Examination Duration:03 Hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. It is mandatory to appear in at-least two minor exams. Apart from minor examination, Class Performance will be measured through percentage of lectures attended (4 marks), Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Pre-requisites: Programming in C, Knowledge of Computer Fundamentals

Sr. No.	Course Outcomes At the end of the semester, students will be able to:	RBT Level
CO 1	**Describe** the various functions and components of operating systems.	LOTS: Level 1 Remember
CO 2	**Explain** fundamental concepts of operating systems.	LOTS: Level 2 Understand
CO 3	**Apply** operating system design concepts for solving problems regarding scheduling, memory management, disk management and deadlocks etc.	LOTS: Level 3 Apply
CO 4	**Analyze** the issues related to various operating systems and **compare** the performance of different algorithms for scheduling, memory management, deadlocks etc.	HOTS: Level 4 Analyze
CO 5	**Evaluate** the performance of different algorithms of operating systems.	HOTS: Level 5 Evaluate

Course Contents

UNIT-I

INTRODUCTORY CONCEPTS: Introduction to Operating System, Types of Operating systems, operating system services and systems calls, system programs, operating system structure. Operating systems generation. Case Studies: Comparative study of WINDOW, UNIX & LINUX system

UNIT-II

PROCESSES: Process concept: Process state, Process Control Block, Process Scheduling Operations on processes, cooperating processes. CPU scheduling: scheduling criteria, Scheduling

Algorithms: First Come First Serve Scheduling, Shortest Job First Scheduling, Priority Scheduling, Round-Robin Scheduling, Multi-level queue scheduling, Algorithm evaluation, multiple processor scheduling. Critical-section problem, Semaphores.

UNIT-III

STORAGE MANAGEMENT: Storage allocation methods: Single contiguous allocation, non-contiguous memory allocation, Paging and Segmentation techniques, segmentation with paging, Virtual memory concepts, Demand Paging, Page replacement Algorithms, Thrashing.
FILE SYSTEMS: File Types & Access Methods, Disk Space Allocation Methods: Contiguous Allocation, Linked Allocation, Indexed Allocation, Structured Organizations, Disk Scheduling Techniques.

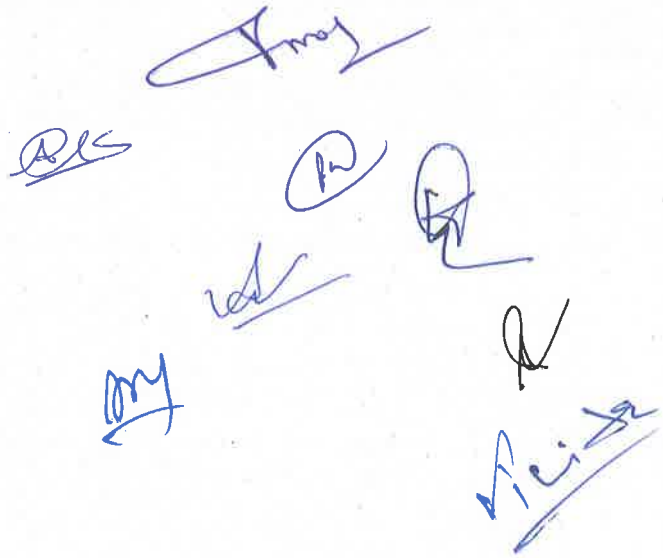
UNIT-IV

DEADLOCK: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

SYSTEM PROTECTION: Goals, Principles, Domain of Protection, Access Matrix, Access Control

TEXT/ REFERENCE BOOKS:

1. Silberschatz, Peter B. Galvin and Greg Gagne, *Operating System Concepts*, 8th Edition, WileyIndian Edition.
2. Andrew S Tanenbaum, *Modern Operating Systems,* Third Edition, Prentice Hall India.
3. Naresh Chauhan, *Principles of Operating Systems*, Oxford Press.
4. D.M. Dhamdhere, *Operating Systems*, 2nd edition, Tata McGraw Hill.
5. William Stallings, *Operating Systems– Internals and Design Principles*, 5th Edition, Prentice Hall India.



Course Articulation Matrix:

Operating System (PCC-ENC208-T)															
List of Course Outcomes	**Program Outcomes (PO)**												**Program Specific Outcomes (PSO)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1: Describe the various functions and components of operating systems. **LOTS: Level 1 (Remember)**	3	2	3	1	-	1	-	1	1	1	2	1	3	3	2
CO 2: Explain fundamental concepts of operating systems. **LOTS: Level 2 (Understand)**	2	2	2	1	-	-	-	2	1	1	1	1	3	2	2
CO 3: Apply operating system design concepts for solving problems regarding scheduling, memory management, disk management and deadlocks etc. **LOTS: Level 3 (Apply)**	3	2	1	2	1	-	-	2	1	1	2	1	2	2	3
CO 4: Analyze the issues related to various operating systems and compare the performance of different algorithms for scheduling, memory management, deadlocks etc. **HOTS: Level 4 (Analyze)**	3	2	1	2	1	-	2	2	1	1	1	2	2	3	3
CO 5: Evaluate the performance of different algorithms of operating systems. **HOTS Level 5 (Evalaute)**	3	2	1	2	1	-	1	2	1	1	2	2	2	3	3
Level of Attainments:															

Embedded System Lab
PCC-ENC204-P

General Course Information

Course Credits: 1 Contact Hours: 2hrs/week/groups (L-T-P: 0-0-2) Mode: Lab Work Duration of Exam Hours: 03 Hours	*** Course Assessment Methods (Internal: 50; External: 50)** The internal and external assessment is based on the level of participation in laboratory sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the lab course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator / Internal Examiners/ External Examiners will maintain and submit the bifurcation of marks obtained by the students in their respective internal/external evaluations in the specified proformas (attached herewith as Annexures I and II) to the respective departments in addition to the submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.

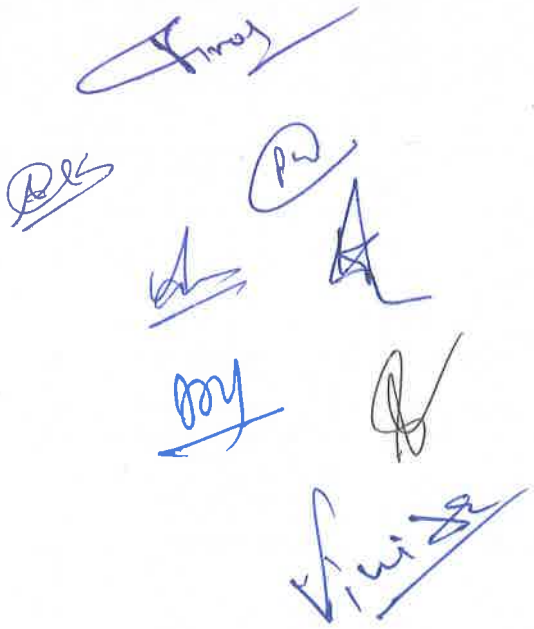
Pre-requisites: Digital Electronics & Analog Electronics

Sr. No.	At the end of the semester, students will be able:	RBT Level
CO 1	**Understand software** tools and apply these tools to write a program for microcontroller based applications.	LOTS: Levels 3 Apply
CO 2	**Analyze and compare** the outcomes of different experimental programs.	HOTS: Level 4 Analyse
CO 3	**Evaluate** the performance of different types of instructions set to write assembly language programs on different software.	HOTS: Level 5 Evaluate
CO 4	**Integrate** knowledge for design of different types of microcontroller based applications through the use of timers & interrupts.	HOTS: Level 6 Create
CO 5	**Create** written records for the given experiments with problem definition, solution, observations & conclusion.	HOTS: Level 6 Create
CO 6	**Demonstrate** ethical practices while performing lab experiments individually or in the group.	LOTS: Level 3 Apply

LIST OF EXPERIMENTS

1. To configure MPLab IDE tool.
2. Write an assembly language program to perform addition operation using PIC 16 Microcontroller.
3. Write an assembly language program to perform subtraction operation using PIC 16 Microcontroller.
4. Write an assembly language program to perform multiplication operation using PIC 16 Microcontroller.
5. Write an assembly language program to perform division operation using PIC 16 Microcontroller.
6. Write an assembly language program to blink an LED using nested loop.
7. Write an assembly language program to find largest no. from an array.
8. Design LED blinking circuit using PIC and Proteus simulator.
9. Design an LCD interfacing circuit using PIC and Proteus simulator.
10. Write a sketch to blink an LED using Arduino Uno.
11. Write a sketch to blink an LED through push to ON button using Arduino Uno.
12. Write a sketch to blink an array of LED in chasing pattern using Arduino Uno.
13. Write a sketch to measure distance through Ultrasonic sensor using Arduino Uno.
14. Write a sketch to measure temperature using Arduino Uno.

Note: At least eight experiments are to be performed in the semester, out of which at least six experiments should be performed from above list. Remaining experiments may either be performed from the above list or designed & set by the concerned course coordinator/institution as per the scope of the syllabus.



CO-PO Articulation Matrix: Embedded System Lab (PCC-ENC204-P)															
List of Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1: **Understand software** tools and apply these tools to write a program for microcontroller based applications. **LOTS: L3 (Apply)**	3	1	1	-	1	1	-	1	2	-	-	1	3	2	1
CO 2: Analyze and compare the outcomes of different experimental programs. **HOTS: L4 (Analyze)**	2	2	1	-	1	1	-	1	2	-	-	1	3	2	1
CO 3: **Evaluate** the performance of different types of instructions set to write assembly language programs on different software. **HOTS: L5 (Evaluate)**	2	1	2	-	1	1	-	1	2	-	-	1	2	2	2
CO 4: **Integrate** knowledge for design of different types of microcontroller based applications through the use of timers & interrupts. **HOTS L6 (Create)**	2	1	3	1	2	2	1	2	3	-	1	2	3	2	3
CO 5: **Create** written records for the given experiments with problem definition, solution, observations & conclusion. **HOTS L6 (Create)**	-	-	-	-	-	-	-	2	1	3	-	2	-	-	-
CO 6: **Demonstrate** ethical practices while performing lab experiments individually or in the group. **LOTS: L3 (Apply)**	-	-	-	-	-	-	-	3	1	-	-	3	-	-	-
Level of Attainments:															

Analog Electronics-II Lab
PCC-ENC206-P

Course Credits: 1 Contact Hours: 2hrs/week/groups (L-T-P: 0-0-2) Mode: Lab Work	**Course Assessment Methods (Internal: 50; External: 50)** The internal and external assessment is based on the level of participation in laboratory sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the lab course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator / Internal Examiners/ External Examiners will maintain and submit the bifurcation of marks obtained by the students in their respective internal/external evaluations in the specified proformas (attached herewith as Annexures I and II) to the respective departments in addition to the submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.

Prerequisite : Analog Electronics-I

Course Outcomes

Sr. No.	At the end of the semester, students will be able to:	RBT Level
CO 1	**Examine** the characteristics of FET, amplifiers and oscillators.	LOTS: L3 (Apply)
CO 2	**Analyze & Evaluate** the analog devices and circuits in terms of their performance parameters.	HOTS: L4 & L5 (Analyze and Evaluate)
CO 3	**Design** analog circuits for a given set of parameters.	HOTS: L6(Create)
CO 4	**Create** written records for the given experiments with problem definition, solution, observation and conclusion.	HOTS: L6(Create)
CO 5	**Demonstrate** ethical practices while performing lab experiments individually or in groups.	LOTS: L3(Apply)

List of Experiments

1. To design the circuit for transistor as switch and verify its operation.
2. To design the circuit for FET as switch and verify its operation.
3. To set up a single stage RC coupled CE amplifier and plot its frequency response. Compute its bandwidth.
4. To design the circuit for BJT Darlington Emitter Follower.
5. To design the circuit for common collector configuration as Buffer.
6. To design Inverting amplifier using Op-amp and verify the gain.
7. To design Non -Inverting amplifier using Op-amp and verify the gain.
8. To design the RC phase shift oscillator circuit and observe its output.
9. To design the Wein bridge oscillator circuit and observe its output.
10. To design the Hartley's oscillator circuit and observe its output.
11. To design the Colpitt's oscillator circuit and observe its output.
12. To design the Integrator circuit and observe its output.
13. To design the Differentiator circuit using observe its output
14. To design a square, triangular and sine wave generator using Op-amp.
15. To study the V-I characteristics of MOSFET in Common Gate configurations.
16. To study the V-I characteristics of MOSFET in Common Source configurations.
17. To study the V-I characteristics of MOSFET in Common Drain configurations.
18. To design the circuit for common source configuration as an amplifier and plot its frequency response.
19. Project (Any topic related to the scope of the course).

Note: At least 10 experiments are to be performed in the semester, out of which minimum 7 experiments should be performed from above list. Remaining experiments may either be performed from the above list or designed and set by concerned Course Coordinator/department as per the scope of the syllabus.

Course Articulation Matrix:

CO-PO Articulation Matrix: Analog Electronics -II Lab (PCC-ENC206-P)															
List of Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1: Examine the characteristics of FET,BJT, amplifiers and oscillators.	3	2	3	2	2	3	1	2	2	2	2	2	3	2	2
CO 2: Analyze & Evaluate the analog devices and circuits in terms of their performance parameters. **HOTS: L4 & L5 (Analyze and Evaluate)**	2	2	2	2	2	3	1	-	3	2	3	2	3	3	3
CO 3: Design analog circuits for a given set of parameters for some applications. **HOTS: L6(Create)**	2	2	2	2	3	3	1	-	3	3	3	2	2	2	3
CO 4: Create written records for the given experiments with problem definition, solution, observation and conclusion. **HOTS: L6(Create)**	2	2	2	2	2	3	1	-	3	2	2	2	3	3	3
CO 5: Demonstrate ethical practices while performing lab experiments individually or in the group. **LOTS: L3 (Apply)**	3	2	3	2	2	3	2	-	3	2	2	2	3	3	2
Level of Attainments:															

Operating System Lab
PCC-ENC208-P

General Course Information

Course Credits: 1 Contact Hours: 2hrs/week/groups (L-T-P: 0-0-2) Mode: Lab Work Duration of Examination Hours is 3 Hours	**Course Assessment Methods (Internal: 50; External: 50)** The internal and external assessment is based on the level of participation in laboratory sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the lab course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator / Internal Examiners/ External Examiners will maintain and submit the bifurcation of marks obtained by the students in their respective internal/external evaluations in the specified proformas (attached herewith as Annexures I and II) to the respective departments in addition to the submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.

Pre-requisites: Programming for Problem Solving using C

Sr. No.	At the end of the semester, students will be able:	RBT Level
CO 1	**Apply** the basic concepts of file system and management, process control, scheduling and communication, as well as memory management.	HOTS: Level 3 Apply
CO 2	**Analyze** and compare various algorithms for scheduling, page replacement, and deadlock handling.	HOTS: Level 4 Analyze
CO 3	**Evaluate** the performance of various algorithms for scheduling, page replacement, and deadlock handling.	HOTS: Level 5 Evaluate
CO 4	**Create** written records for the given experiments with problem definition, solution, observations & conclusion.	HOTS: Level 6 Create
CO 5	**Demonstrate** ethical practices while performing lab experiments individually or in the group.	LOTS: Level 3 Apply

LIST OF EXPERIMENTS

1. Write a program to implement CPU scheduling for first come first serve.
2. Write a program to implement CPU scheduling for shortest job first.
3. Write a program to perform priority scheduling.
4. Write a program to implement CPU scheduling for Round Robin.
5. Write a program for page replacement policy using a) LRU b) FIFO c) Optimal.
6. Write a program to implement first fit, best fit and worst fit algorithm for memory management.
7. Write a program to implement reader/writer problem using semaphore.
8. Write a program to implement Banker's algorithm for deadlock avoidance.
9. Write a program to implement Banker's algorithm for deadlock prevention.
10. Write a program to implement the following the following file allocation methods: (a) contiguous (b) Linked (c) Indexed .
11. Write a program to simulate the following techniques of memory management:

    a) Paging b) Segmentation
12. Write a program to simulate the following File organization techniques:

    a) Single level directory b) Two level c) Hierarchical.

Note: At least eight experiments are to be performed in the semester, out of which at least six experiments should be performed from above list. Remaining experiments may either be performed from the above list or designed & set by the concerned course coordinator/institution as per the scope of the syllabus.

Operating System Lab (PCC-ENC208-P)															
List of Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1: Apply the basic concepts of file system and management, process control, scheduling and communication, as well as memory management. **HOTS: L3 (Apply)**	2	2	1	-	1	1	-	1	2	-	-	1	3	2	1
CO 2: Analyze and compare various algorithms for scheduling, page replacement, and deadlock handling. **HOTS: L4 (Analyze)**	2	1	2	-	1	1	-	1	2	-	-	1	2	2	2
CO 3: Evaluate the performance of various algorithms for scheduling, page replacement, and deadlock handling. **HOTS L5 (Evaluate)**	2	1	3	1	2	2	1	2	3	-	1	2	3	2	3
CO 4: Create written records for the given experiments with problem definition, solution, observations & conclusion. **HOTS L6 (Create)**	-	-	-	-	-	-	-	2	1	3	-	2	-	-	-
CO 5: Demonstrate ethical practices while performing lab experiments individually or in the group. **LOTS: L3 (Apply)**	-	-	-	-	-	-	-	3	1	-	-	3	-	-	-
Level of Attainments:															

Skill & Innovation Lab
PCC-ENC210-P

General Course Information

Course Credits: 1.5 Contact Hours: 3hrs/week/groups (L-T-P: 0-0-3) Mode: Lab Work Duration of Exam Hours:- 03 Hours	**Course Assessment Methods (Internal: 50; External: 50)** The internal and external assessment is based on the level of participation in laboratory sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed. There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations. The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the lab course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students. The Course Coordinator / Internal Examiners/ External Examiners will maintain and submit the bifurcation of marks obtained by the students in their respective internal/external evaluations in the specified proformas (attached herewith as Annexures I and II) to the respective departments in addition to the submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.

Pre-requisites: Basic Electronics Lab, Analog Electronics- I Lab, Analog Electronics -II Lab

Sr. No.	At the end of the semester, students will be able:	RBT Level
CO 1	**Understand** software/hardware tools and apply these tools to design PCB and fabrication process.	LOTS: Levels 3 Apply
CO 2	**Analyze** the outcomes of different sensors interfaced with hardware.	HOTS: Level 4 Analyse
CO 3	**Evaluate** the performance of Circuit schematic design, PCB design and fabrication process.	HOTS: Level 5 Evaluate
CO 4	**Integrate** knowledge for design and construct PCB for electronic circuits.	HOTS: Level 6 Create
CO 5	**Create** written records for the given experiments with PCB design of different circuits and Arduino interfacing with different sensors.	HOTS: Level 6 Create
CO 6	**Demonstrate** ethical practices while performing lab experiments individually or in the group.	LOTS: Level 3 Apply

LIST OF EXPERIMENTS

1. Introduction of circuit schematic and layout tool.
2. Design schematic of regulated DC power supply of 5V.
3. Design schematic of regulated DC power supply of 12V.
4. Design schematic of regulated Dual DC power supply.
5. Design layout (Silk layer and copper layer) of regulated DC power supply.
6. Introduction of Design rule check (DRC) and Netlist.
7. To fabricate a PCB for regulated DC power supply circuit including image transfer, etching, drilling and soldering.
8. To test electronic circuit implemented on PCB.
9. Design schematic of electronic circuit of practical importance.
10. Design layout (Silk layer and copper layer) of electronic circuit of practical importance.
11. To fabricate PCB and test electronic circuit of practical importance.
12. To study data sheets of diode and transistors.
13. To write a code to blink an LED through PUSH, to detect an object, to detect gas leakage, to measure distance through Ultrasonic Sensor, measure temperature, measure Humidity using Arduino Uno.
14. Write a code for interfacing seven segment display with Arduino Uno.
15. Design schematic of electronic circuit of practical importance using Arduino.

NOTE: At least 10 experiments are to be performed in the semester, out of which minimum 7 experiments should be performed from above list. Remaining experiments may either be performed from the above list or designed and set by concerned Course Coordinator/department as per the scope of the syllabus. The students must prepare Mini Project (Ex. No. 11) in the group of two-three students before the end of semester.

CO-PO Articulation Matrix: Skill & Innovation Lab (PCC-ENC210-P)															
List of Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1: Understand software/hardware tools and apply these tools to design PCB and fabrication process. **LOTS: L3 (Apply)**	3	2	3	2	2	3	1	2	2	2	2	2	3	2	2
CO 2: Analyze the outcomes of different sensors interfaced with hardware. **HOTS: L4 (Analyze)**	2	2	2	2	2	3	1	-	3	2	3	2	3	3	3
CO 3: Evaluate the performance of Circuit schematic design, PCB design and fabrication process. **HOTS: L5 (Evaluate)**	2	2	2	2	3	3	1	-	3	3	3	2	2	2	3
CO 4: Integrate knowledge for design and construct PCB for electronic circuits. **HOTS L6 (Create)**	2	2	2	2	2	3	1	-	3	2	2	2	3	3	3
CO 5: Create written records for the given experiments with PCB design of different circuits and Arduino interfacing with different sensors. **HOTS L6 (Create)**	3	3	3	2	2	3	2	-	3	2	2	2	3	2	2
CO 6: Demonstrate ethical practices while performing lab experiments individually or in the group. **LOTS: L3 (Apply)**	3	2	3	2	2	3	2	-	3	2	2	2	3	3	2
Level of Attainments:															

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Group A *(ECE, EE, EEE, PT, PKG, P&P, ME, Agri, Aero, Auto)* : 4th Semester
Group B *(CSE, IT, BME, FT, Civil)* : 5th Semester

General Course Information	
Course Code: MC104-T Course Credit: 0	Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70) Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Contact Hours: 2/week, (L-T-P:2-0-0)	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Mode: Lectures Examination Duration: 3 Hours	

About the Course: This course is designed to acquaint students with Indian knowledge traditions. It introduces students to Vedic period, Post Vedic period, Sufi and Bhakti Movement in India, the ancient scientists of India and social reform movements of 19th century in India.

Course Outcomes: By the end of the course students will be able to:

- **CO1.** Recognize the forms and sources of Indian traditional knowledge. **(LOTS: Level 1: Remember).**
- **CO2.** Identify the contribution of the great ancient Indian scientists and spiritual leaders to the world of knowledge. **(LOTS: Level 2: Understand)**
- **CO3.** Apply the reasoning based on objectivity and contextual knowledge to address the social and cultural issues prevalent in Indian society. **(LOTS: Level 3: Apply)**
- **CO4.** Differentiate the myths, superstitions from reality in context of traditional knowledge to protect the physical and social environment. **(LOTS: Level 4: Evaluate)**
- **CO5.** Suggest means of creating a just and fair social environment that is free from any prejudices and intolerance for different opinions and cultures. **(LOTS: Level 6: Create)**

UNIT-I

Introduction to Indian Tradition Knowledge: Defining traditional knowledge, forms, sources and dissemination of traditional knowledge. **Vedic Period:** Vedas and Upanishads, Yogsutras of Patanjali **Post Vedic Period:** Budhism, Janism and Indian Materialism: Bhartiya Darshan

18/7/19

CO-PO Articulation Matrix Essence of Indian Traditional Knowledge (MC104-T)

List of Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO13	PSO14	PSO15
CO1.Recognise the forms and sources of Indian traditional knowledge. (LOTS: Level 1: Remember)	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2.Identify the contribution of the great ancient Indian scientists and spiritual leaders to the world of knowledge. (LOTS: Level 2: Understand)	-	2	1	-	-	3	-	-	-	-	-	1	-	-	-
CO3.Apply the reasoning based on objectivity and contextual knowledge to address the social and cultural issues prevalent in Indian society. (LOTS: Level 3: Apply)	-	3	3	2	-	3	-	-	-	-	-	3	-	-	-
CO4.Differentiate the myths, superstitions from reality in context of traditional knowledge to protect the physical and social environment. (LOTS: Level 4: Evaluate)	-	2	3	3	-	3	1	-	-	-	-	3	-	-	-
CO5.Suggest means of creating a just and fair social environment that is free from any prejudices and intolerance for different opinions and cultures. (LOTS: Level 6: Create)	-	3	3	3	-	3	-	-	-	-	-	3	-	-	-
Level of Attainments MC104-T															

Human Values and Personality Development

General Course Information

Course Code: HSMC201-P Course Credit: Non-Credit Type: Humanities and Social Sciences including Management Courses Contact Hours: 3 hours/week Mode: Group Discussions, Workshops	**Course Assessment Methods: Total Marks: 100 (Internal evaluation only)** **Internal Examinations + Class Performance: 50** **Interview/VIVA-VOCE=50** It is a non-credit qualifying course only. The assessment will be completely internal divided into two components (50+50). The assessment is based on the level of participation in personality development-based activities, the learning of core human values, timely submission of assignments and the performance in interview/ VIVA-VOCE. There will be a continuous process for personality development and learning of human values. Two internal examinations (each of 50 marks) will be conducted by the course coordinator in the week before or after the internal examinations for the theory courses. The marks for the first component will be calculated as the average of these two internal examinations. The assessment for 50 marks (second component) will be made through Interview/VIVA-VOCE mode by a committee of two faculty members including the course coordinator and a faculty member appointed by the Chairperson of the concern Department.

Pre-requisites: None

About the Course: This course is designed to develop a holistic perspective based on self-exploration and co-existence in society and nature. The focus is on to understand harmony and being in harmony with the society and the environment around us. The students will nurture a habit of self-reflection and courage to act. This course includes practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking).

Course Outcomes: By the end of the course students will be able to:

CO1: exhibit awareness about oneself, one's surroundings and goals in one's life. (LOTS: Level 2: Understand)
CO2: stay in harmony with society and nature. (LOTS: Level 2: Understand)
CO3: develop healthy and harmonious relationships. (LOTS: Level 3: Apply).
CO4: work in groups and develop team spirit. (HOTS: Level 4: analyze)
CO5: exhibit leadership qualities. (HOTS: Level 3: Apply)
CO6: excel in personal and professional life. (HOTS: Level 3: Apply)

Course Content

Unit I

Understanding the concept of self. Exploration of self with JOHARI-Window. Self-Esteem, Characteristics of individuals with low and high self-esteem. Self Confidence, strategies of building self-confidence.

Personality: Definition & Types & Traits; Relevance and importance of nature and nurture in the development of personality.

Unit 2

Nature of Socialization: Socialization process. Contributing to society and nation. Importance of discipline and hardwork. Ecological responsibility of Engineers. Professional Ethics: Competence in Professional values and ethics. Personal and Professional Excellence: Identifying long-term choices and goals.

Unit 3

Meaning and nature of teams, External and internal factors affecting team building. Leadership Meaning, Nature and Functions. leadership styles in organization. Meaning and nature of stress, causes, effects and management.

Unit 4

Meaning and importance of human rights, Human rights awareness. Harmony in nature, understanding co-existence, harmony at all levels of existence. Understanding the concept of happiness and well-being. Role and importance of positive emotions: Gratitude, hope and optimism.

Text and Reference Books:

1. Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour.
2. Dressler, David and Cans, Donald: The Study of Human Interaction.
3. Pestonjee, D.M, Pareek, Udai, Agarwal Rita; Studies in Stress And its Management
4. Organizational Behaviour, Davis, K.
5. Hoover, Judhith D. Effective Small Group and Team Communication, 2002, Harcourt College Publishers
6. Dick, McCann & Margerison, Charles: Team Management, 1992 Edition, viva books
7. Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
8. Dressler, David and Cans, Donald: The Study of Human Interaction
9. Pestonjee, D.M, Pareek, Udai, Agarwal Rita; Studies in Stress And its Management
10. Pestonjee, D.M.; Stress and Coping: The Indian Experience
11. Clegg, Brian; Instant Stress Management – Bring calm to your life now.

Annexure-I

Office of the Dean Faculty of Engineering and Technology
Guru Jambheshwar University of Science and Technology
Hisar-125001
(Established by State Legislative Act 17 of 1995)
'A' GRADE NAAC Accredited

Faculty of Engineering and Technology
Guru Jambheshwar University of Science and Technology, Hisar-125001

Internal Laboratory Course Evaluation Proforma

Minor Laboratory Course Evaluation-I (MLE-I) / Minor Laboratory Course Evaluation-II (MLE-II)

Name of the Programme:
Semester:
Nomenclature of the Course:
Course Code:

SR. No.	Roll. No.	Written work and /or Conduct of Experiment(s)	(VIVA-VOCE) based on laboratory Course Outcomes CO-2 to CO-4			Laboratory Record/File	Class Performance (Attendance/Ethical practices followed, Self-Learning and Team Spirit)	Total Marks
		CO-1 (15)	CO-2 (5)	CO-3 (5)	CO-4 (5)	CO-5 (10)	CO-6 (10)	50
1								
2								
3								
.								
.								
Total No. of Students:			Present:			Absent		

Name of the Course Coordinator	Signature of the Course Coordinator