

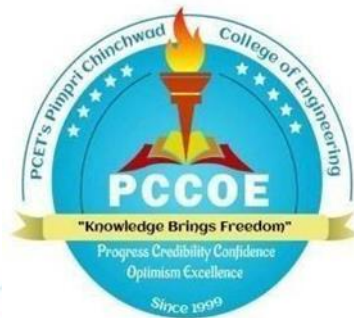
Pimpri Chinchwad Education Trust's

## **PIMPRI CHINCHWAD COLLEGE OF ENGINEERING**

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

(An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune)

### **DEPARTMENT OF E&TC ENGINEERING**



### **Curriculum Structure and Syllabus**

of

### **Second Year B. Tech. E&TC Engineering (Regulations 2023)**



**Effective from Academic Year 2026-27 with minor change.**



**Pimpri Chinchwad Education Trust's  
Pimpri Chinchwad College of Engineering**

**Course Approval Summary**

**Board of study – Department of Applied Sciences and Humanities**

Sr. No.	Course Name	Course Code	Page Number	Signature and stamp of BoS
1	Computational Techniques	BSH23OE02	26	
2	Applied Mathematics	BSH23OE03	27	
3	Computational Techniques	BSH24OE07	28	
4	Mathematical Optimization	BSH24OE08	29	
5	Applied Mathematics	BSH23OE01	30	
6	Neural Network and Fuzzy Logic Control	BSH23OE06	33	
8	Universal Human Values	BSH23VE01	46	
9	Statistical Data Analysis using R	BSH24OE04	62	
10	Advanced Materials and Characterizations	BSH24OE05	65	
11	Professional Development and Training	BSH24AE05	78	
12	Constitution of India	BSH24VE02	83	

**Board of study -Department of Civil Engineering**

Sr. No.	Course Name	Course Code	Page Number	Signature and stamp of BoS
1	Total Quality Management	BCI23OE02	34	
2	Building services and Maintenance	BCI23OE03	35	
3	E-Waste Management	BCI24OE01	63	

**Board of study-Department of Computer Engineering**

Sr. No	Course Name	Course Code	Page Number	Signature and stamp of BoS
1	Fundamentals of Database Management System	BCE23OE01	36	
2	Principles of Software Engineering	BCE23OE02	37	
3	Android App Development with Kotlin	BCE23OE03	38	

**Board of study-Department of CSE(AIML)**

Sr. No.	Course Name	Course Code	Page Number	Signature and stamp of BoS
1	AI for Financial Modeling	BCS23OE01	39	
2	Data Science	BCS24OE02	67	

**Board of Study- Department of E &TC**

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS
1	Electronic Devices and Circuits	BET23PC01	16	
2	Electronic Devices and Circuits Lab.	BET23PC02	18	
3	Network Analysis	BET23PC03	20	
4	Signals and Systems	BET23PC04	22	
5	Signals and Systems Lab	BET23PC05	24	
6	Community Engagement Project	BET23EL01	48	
7	Control Systems	BET24PC01	51	
8	Microcontrollers	BET24PC02	53	
9	Microcontrollers Lab.	BET24PC03	55	
10	Analog Integrated Circuits	BET24PC04	57	
11	Analog Integrated Circuits Lab	BET24PC05	59	
12	Data Structures and Programming Lab.	BET24VS01	75	
13	Industrial Management	BET23EM01	45	
14	Project Management	BET24EM01	80	
15	Human Behavior, Ethics & Wisdom	BET23OE04	43	

**Board of study -Department of Information Technology Engineering**

Sr. No.	Course Name	Course Code	Page Number	Signature and stamp of BoS
1	Cyber Security : Understanding Cyber Crimes and Legal Perspectives	BIT23OE02	40	
2	Operating System's Administration	BIT24OE01	69	

**Board of study -Department of Mechanical Engineering**

Sr. No.	Course Name	Course Code	Page Number	Signature and stamp of BoS
1	Industry 4.0	BME23OE04	41	
2	Energy storage management	BME23OE05	42	
3	Material Science	BME24OE01	70	
4	Drawing for Engineers	BME24OE02	71	
5	Fundamentals of Mechanical Components and Systems	BME24OE03	72	

Approved by Academic Council:

Chairman, Academic Council  
Pimpri Chinchwad College of Engineering

## **Institute Vision**

To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value Added Quality Education through a matching ecosystem for building successful careers.

## **Institute Mission**

1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute.
2. Imparting right Attitude, Skills, Knowledge for self-sustenance through Quality Education.
3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with an ability to think and act independently in demanding situations.

## **EOMS Policy**

“We at PCCOE are committed to offer exemplarily Ethical, Sustainable and Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders.

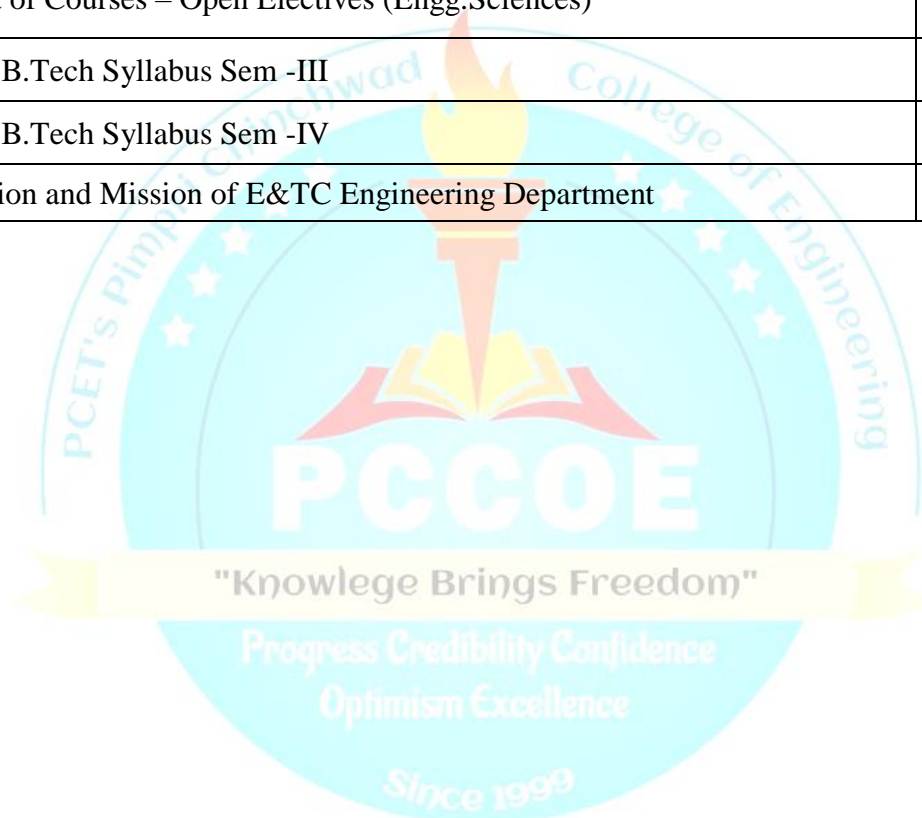
We shall strive for technical development of students by creating globally competent and sensible engineers, researchers and entrepreneurs through Quality Education.

We are committed for Institute’s social responsibilities and managing Intellectual property.

We shall achieve this by establishing and strengthening state-of-the-art Engineering Institute through continual improvement in effective implementation of Educational Organizations Management Systems (EOMS).”

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**CURRICULUM FRAMEWORK**  
(Regulations 2023)

**LIST OF ABBREVIATIONS**

Sr. No.	Abbreviation	Type of Course
1	BSC	Basic Science Course
2	ESC	Engineering Science Course
3	PCC	Programme Core Course
4	PEC	Programme Elective Course
5	MDM	Multidisciplinary Minor
6	OEC	Open Elective Course
7	VSEC	Vocational and Skill Enhancement Course
8	AEC	Ability Enhancement Course
9	EEM	Entrepreneurship/Economics/Management Course
10	IKS	Indian Knowledge System
11	VEC	Value Education Course
12	ELC	Experiential Learning Courses
13	LLC	Liberal Learning Courses

**COURSE WISE CREDIT DISTRIBUTION**

Sr. No.	Type of Course	No. of Courses	Total	
			NO.	%
1	Basic Science Course(BSC)	8	14	8.75
2	Engineering Science Course(ESC)	6	12	7.5
3	Programme Core Course(PCC)	26	46	28.75
4	Programme Elective Course(PEC)	13	20	12.5
5	Multidisciplinary Minor(MDM)	6	14	8.75
6	Open Elective(OEC)	3	6	3.75
7	Vocational and Skill Enhancement	4	8	5
8	Ability Enhancement Course(AEC)	2	4	2.5
9	Entrepreneurship/Economics/Management	2	4	2.5
10	Indian Knowledge System(IKS)	1	2	1.25
11	Value Education Course(VEC)	2	4	2.5
12	Experiential Learning Courses(ELC)	5	22	13.75
13	Liberal Learning Courses(LLC)	2	4	2.5
<b>Total</b>		<b>80</b>	<b>160</b>	<b>100</b>

## SEMESTER-WISE COURSE DISTRIBUTION

Course Distribution: Semester Wise										
Sr. No.	Type of Course	No. of Courses / Semester								Total
		1	2	3	4	5	6	7	8	
1.	Basic Science Course(BSC)	4	4	-	-	-	-	-	-	8
2.	Engineering Science Course(ESC)	4	2	-	-	-	-	-	-	6
3.	Programme Core Course(PCC)	-	1	5	5	6	4	5	-	26
4.	Programme Elective Course(PEC)	-	-	-	-	3	5	5	-	13
5.	Multidisciplinary Minor(MDM)	-	-	1	1	2	1	1	-	6
6.	Open Elective(OEC)	-	-	2	1	-	-	-	-	3
7.	Vocational and Skill Enhancement Course(VSEC)	1	1	-	1	-	1	-	-	4
8.	Ability Enhancement Course(AEC)	1	-	-	1	-	-	-	-	2
9.	Entrepreneurship/Economics/Management Course(EEM)	-	-	1	1	-	-	-	-	2
10.	Indian Knowledge System(IKS)	-	1	-	-	-	-	-	-	1
11.	Value Education Course(VEC)	-	-	1	1	-	-	-	-	2
12.	Experiential Learning Courses(ELC)	-	-	1	-	-	-	-	4	5
13.	Liberal Learning Courses(LLC)	1	1	-	-	-	-	-	-	2
<b>Total</b>		<b>11</b>	<b>10</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>4</b>	<b>80</b>

## SEMESTER-WISE CREDIT DISTRIBUTION

Credit Distribution: Semester Wise										
Sr.No.	Type of Course	No. of Credits / Semester								Total
		1	2	3	4	5	6	7	8	
1.	Basic Science Course(BSC)	7	7	-	-	-	-	-	-	14
2.	Engineering Science Course(ESC)	7	5	-	-	-	-	-	-	12
3.	Programme Core Course(PCC)	-	2	8	8	12	8	8	-	46
4.	Programme Elective Course(PEC)	-	-	-	-	4	8	8	-	20
5.	Multidisciplinary Minor(MDM)	-	-	2	2	4	2	4	-	14
6.	Open Elective(OEC)	-	-	4	2	-	-	-	-	6
7.	Vocational and Skill Enhancement Course(VSEC)	2	2	-	2	-	2	-	-	8
8.	Ability Enhancement Course(AEC)	2	-	-	2	-	-	-	-	4
9.	Entrepreneurship/Economics/Management Course(EEM)	-	-	2	2	-	-	-	-	4
10.	Indian Knowledge System(IKS)	-	2	-	-	-	-	-	-	2
11.	Value Education Course(VEC)	-	-	2	2	-	-	-	-	4
12.	Experiential Learning Courses(ELC)	-	-	2	-	-	-	-	20	22
13.	Liberal Learning Courses(LLC)	2	2	-	-	-	-	-	-	4
<b>Total</b>		<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>160</b>



**Curriculum Structure**  
**S.Y. B.Tech.**  
**Semester-III**

**CURRICULUM STRUCTURE**  
**Second Year B.Tech. (E&TC Engineering) Semester – III**

<b>Second Year B.Tech E&amp;TC Engineering (Regulations 2023 )</b> (With effect from Academic Year 2026-27)																	
Course Code	Course Type	Course Name	Credit Scheme				Teaching Scheme (Hours/Week)				Evaluation Scheme and Marks						
			L	P	T	Total	L	P	T	O	FA		SA	TW	PR	OR	Total
												FA	FA				
BET23 PC01	PCC	Electronic Devices and Circuits	2	-	-	2	2	-	-	1	10	10	30	-	-	-	50
BET23 PC02	PCC	Electronic Devices and Circuits Lab.	-	1	-	1	-	2	-	1	-	-	-	25	25	-	50
BET23 PC03	PCC	Network Analysis	-	2	-	2	-	4	-	1	-	-	-	100	-	-	100
BET23 PC04	PCC	Signals and Systems	2	-	-	2	2	-	-	1	10	10	30	-	-	-	50
BET23 PC05	PCC	Signals and Systems Lab	-	1	-	1	-	2	-	1	-	-	-	25	25	-	50
-	MD	#MDM1	2	-	-	2	2	-	-	-	10	10	30	-	-	-	50
BSH2 3OE02	OEC	OEC-Mathematics	2	-	-	2	2	-	-	-	10	10	30	-	-	-	50
-	OEC	OEC-Department Specific	2	-	-	2	2	-	-	-	10	10	30	-	-	-	50
BET23 EM01	EEM 1	Industrial Management	2	-	-	2	2	-	-	-	10	10	30	-	-	-	50
BSH2 3VE01	VEC	Universal Human Values	2	-	-	2	2	-	-	-	25	25	-	-	-	-	50
BET23 EL01	ELC	Community Engagement Project	-	2	-	2	-	4	-	-	-	-	-	100	-	-	100
<b>Total</b>			<b>14</b>	<b>6</b>	<b>0</b>	<b>20</b>	<b>14</b>	<b>12</b>	<b>0</b>	<b>5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>650</b>

*#Refer separate booklet for Multidisciplinary Minor (MDM) courses*

*L-Lecture, P-Practical, T-Tutorial, O- Self Learning, FA-Formative Assessment, SA-Summative Assessment, TW-Term Work, OR-Oral, PR-Practical*

### List of Open Electives- Mathematics

Course Code	Offered by	Course Name	
BSH23OE01	AS&H	Applied Mathematics (Suggested for Mechanical branch)	Choose any one
BSH23OE02		Computational Techniques ( <b>Suggested for E&amp;TC branch</b> )	
BSH23OE03		Applied Mathematics (Suggested for Civil branch)	
BSH24OE07		Computational Techniques (Suggested for Computer and IT branches)	
BSH24OE08		Mathematical Optimization (Suggested for CSE -AIML branch)	

### List of Open Electives –Department Specific

Course Code	Offered by	Course Name	
BSH23OE06	AS&H	Neural Network and Fuzzy Logic Control	Choose any one
BCI23OE02	Civil	Total Quality Management	
BCI23OE03	Civil	Building Services and Maintenance	
BCE23OE01	Computer	Fundamentals of Database Management System	
BCE23OE02	Computer	Principles of Software Engineering	
BCE23OE03	Computer	Android App Development with Kotlin	
BCS23OE01	CSE(AIML)	AI for Financial Modelling	
BIT23OE02	IT	Cyber Security : Understanding Cyber Crimes and Legal Perspectives	
BME23OE04	Mech	Industry 4.0	
BME23OE05	Mech	Energy storage management	
BET23OE04	E&TC	Human Behavior, Ethics & Wisdom	



**Curriculum Structure**  
**S.Y. B.Tech.**  
**Semester-IV**

Since 1999

## Second Year B.Tech. (E&TC Engineering) Semester – IV

Second Year B.Tech E&TC Engineering (Regulations 2023) (With effect from Academic Year 2026-27)																	
Course Code	Course Type	Course Name	Credit Scheme				Teaching Scheme Hours/Week				Evaluation Scheme and Marks						
			L	P	T	Total	L	P	T	O	FA		SA	TW	PR	OR	Total
												FA 1	FA 2				
BET24P C01	PCC	Control Systems	-	2	-	2	-	4	-	1	25	25	-	50	-	100	
BET24P C02	PCC	Microcontrollers	1	-	-	1	1	-	-	1	10	10	30	-	-	50	
BET24P C03	PCC	Microcontrollers Lab.	-	2	-	2	-	4	-	1	-	-	-	50	50	100	
BET24P C04	PCC	Analog Integrated Circuits	2	-	-	2	2	-	-	1	10	10	30	-	-	50	
BET24P C05	PCC	Analog Integrated Circuits Lab	-	1	-	1	-	2	-	1	-	-	-	25	25	50	
-	MDM	MDM 2	2	-	-	2	2	-	-	-	10	10	30	-	-	50	
-	OEC	OEC-Engineering Science	2	-	-	2	2	-	-	-	10	10	30	-	-	50	
BET24V S01	VSEC	Data Structures and Programming Lab.	-	2	-	2	-	4	-	-	-	-	-	50	50	100	
BSH24A E05	AEC	**Professional Development and Training	-	2	-	2	-	4	-	-	-	-	-	100	-	100	
BET24E M01	EEM2	Project Management	2	-	-	2	2	-	-	-	10	10	30	-	-	50	
BSH24V E02	VEC	Constitution of India	2	-	-	2	2	-	-	-	20	30	-	-	-	50	
<b>Total</b>			<b>11</b>	<b>09</b>	<b>-</b>	<b>20</b>	<b>11</b>	<b>16</b>	<b>-</b>	<b>5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>750</b>	

**\*\*Practicals will be held division wise and not batch wise**

*L-Lecture, P-Practical, T-Tutorial, O- Self Learning, FA-Formative Assessment, SA-Summative Assessment, TW-Term Work, OR-Oral, PR-Practical*

**Note: Exit Policy : Available as a separate document**

**List of Open Electives- Engineering Sciences**


Course Code	Offered by	Course Name	
BSH24OE04	AS&H	Statistical Data Analysis using R	Choose any one
BSH24OE05	AS&H	Advanced Materials and Characterizations	
BCI24OE01	Civil	E-Waste Management	
BCS24OE02	CSE(AIML)	Data Science	
BIT24OE01	IT	Operating System's Administration	
BME24OE01	Mech	Material Science	
BME24OE02	Mech	Drawing for Engineers	
BME24OE03	Mech	Fundamentals of Mechanical Components and Systems	





**Course Syllabus  
Second Year B. Tech.  
Sem-III**

Since 1999

<b>Program :</b>	<b>B. Tech. (E&amp;TC)</b>				<b>Semester: III</b>				
<b>Course :</b>	<b>Electronic Devices and Circuits</b>				<b>Code : BET23PC01</b>				
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>				
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>	
					<b>FA1</b>	<b>FA2</b>			
<b>02</b>	<b>02</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>	
<b>Prior knowledge of</b> a. Basics of semiconductor Physics b. Basic Electronics Engineering <b>is essential.</b>									
<b>Course Objectives:</b> This course aims at enabling students, 1. To provide students with a broad understanding of the principles underlying electronic devices. 2. To educate students on modeling techniques, including modeling complex devices like BJT, JFET, and MOSFET, that are used to build and analyze real-world circuits									
<b>Course Outcomes:</b> After learning the course, the students should be able to: 1. Analyze electronic circuits using a small signal BJT and FET model. 2. Analyze electronic circuits using a small signal MOSFET model. 3. Illustrate the concept of feedback and study feedback amplifiers and oscillators. 4. Compare various power amplifiers.									
<b>Detailed Syllabus:</b>									
<b>Unit</b>	 <b>Description</b>							<b>Duration [Hrs]</b>	
1	<b>Small Signal Amplifier and It's Frequency Response</b> AC analysis of BJT CE amplifier using approximate h- parameters, Comparison of CE, CB, CC amplifiers, AC analysis of JFET CS amplifier, Comparison of CS, CG, CD amplifiers. Frequency response of single stage CE/CS amplifier, Square wave testing of amplifiers, Miller's theorem, Introduction to multistage amplifiers. Diode wave shaping circuits- Clippers and Clampers, Voltage multipliers, Transistorized relay driver circuit.							08	
2	<b>MOSFET AC and DC Analysis</b> Construction of n-channel E- MOSFET, E- MOSFET characteristics & parameters, Non-ideal voltage current characteristics, Common source circuit, Load Line & Modes of operation, Common MOSFET configurations: DC Analysis, Small signal equivalent circuit, Analysis of CS amplifier, Modeling Body effect The MOSFET internal capacitances and high frequency model, Introduction to MOSFET as a basic element in VLSI, Introduction to BiCMOS Technology.							08	
3	<b>Feedback amplifiers and Oscillators</b> Four types of amplifiers, Types of Feedback, Feedback topologies and their comparison, Effect of feedback on terminal characteristics of amplifiers, Examples of voltage series and Current series feedback amplifiers and their analysis. Barkhausen criterion, Types of Oscillator, RC Phase Shift oscillator, Hartley Oscillator, Colpitts oscillator .Crystal oscillator.							07	
4	<b>Power Amplifiers</b> Classification of Power Amplifiers, Class A –Series Fed and Transformer-Coupled type, Class B- Push Pull & Complementary Symmetry Amplifier, Class AB Amplifier, Class C amplifiers ,Class D amplifiers, Distortions in amplifiers, Concept of Total Harmonic Distortion (THD), Comparison of power amplifiers							07	
<b>Total</b>							30		

Self-learning: Choice of contents lies with course faculty with prior approval in course coordinator meeting.

**Text Books:**

1. Boylestead & Nashelsky,—Electronic devices and Circuits Theory, PHI, 11th edition, 2022
2. Donald Neaman,—Electronic Circuit Analysis and Design, Tata McGraw Hill, 3rd Edition, 2016
3. S. Salivahanan,—Electronic Devices and Circuits, Tata McGraw Hill, 2nd Edition, 2014
4. N.P. Deshpande,—Electronic Devices and Circuits Principles and Applications, Tata McGraw Hill, 1st Edition, 2009
5. Sedra and Smith— Microelectronics Circuits, Oxford University Press 2021, 8<sup>th</sup> Edition

**Reference Books:**

1. David A. Bell,—Electronic Device and Circuits, PHI, 5th Edition, 2012
2. Jacob Millman, Christos C. Halkies, Chetan D. Parikh,—Integrated Electronics-Analog and Digital Circuits and Systems, Tata McGraw Hill, 2nd Edition, 2016
3. Floyd,—Electronic Devices, Pearson, 10th Edition, 2017
4. Anil K. Maini and Varsha Agarwal,—Electronic Devices and Circuits, Wiley India, 2nd Edition, 2022

**e-sources:**

1. <https://nptel.ac.in/courses/117102061>
2. <https://nptel.ac.in/courses/117106091>



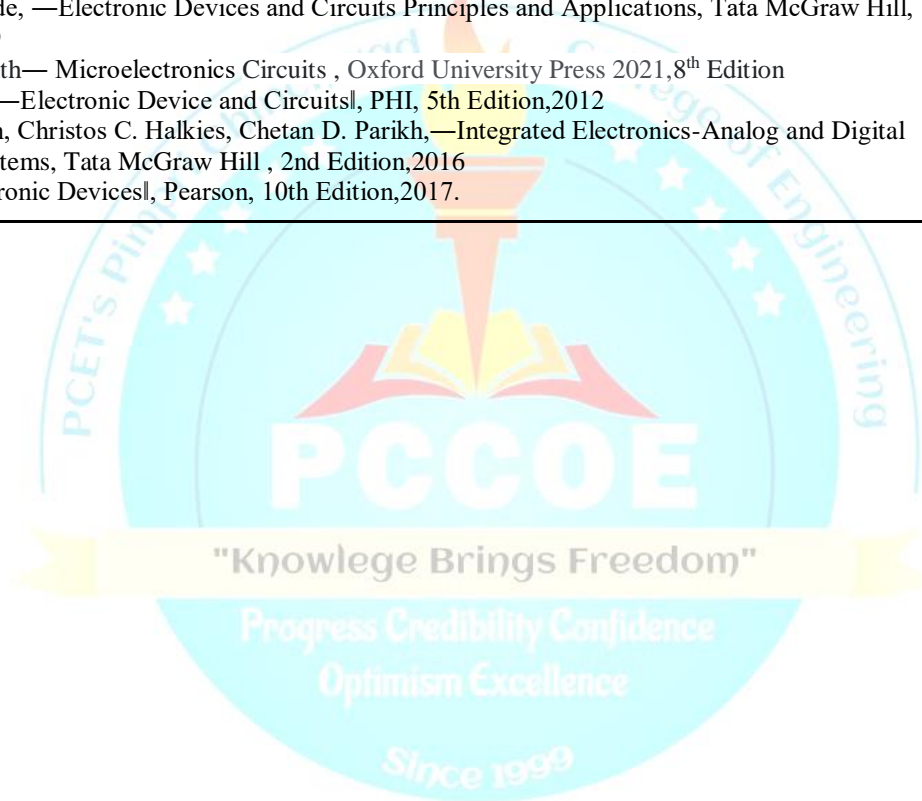
<b>Program: B. Tech. (E&amp;TC)</b>					<b>Semester : III</b>			
<b>Course : Electronic Devices and Circuits Lab.</b>					<b>Code : BET23PC02</b>			
<b>Teaching Scheme (Hrs./Week)</b>					<b>Evaluation Scheme</b>			
<b>Credit</b>	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>TW</b>	<b>OR</b>	<b>PR</b>	<b>Total</b>
<b>1</b>	<b>–</b>	<b>2</b>	<b>–</b>	<b>1</b>	<b>25</b>	<b>–</b>	<b>25</b>	<b>50</b>
<b>Prior knowledge of:</b> a .Basics of semiconductor Physics b. Basic Electronics Engineering								
<b>Course Objectives:</b> The objective of this laboratory is to provide the student with: 1. The knowledge of Designing, Building, Testing and Analyzing aspects of electronic circuits. 2. The capability to use simulation tools for performing various analysis of Electronic circuits								
<b>Course Outcomes:</b> After completing the course, the students should be able to: 1.Design, Build, Test and Analyze performance of Linear applications of above mentioned active Devices. 2.Simulate a few of the circuit applications using appropriate circuit Simulation Package.								
<b>Guidelines: Any Six Experiments is to be performed to meet the above outcomes.</b> <b>Practical:</b> 1. Practical for 25 Marks. 2. Practical Assessment will be based on PART A <b>Term work:</b> 1. Term Work for 25 Marks 2. For Term Work assessment only Mini Project is mandatory.								
<b>Detailed Syllabus</b>								
<b>PART:A</b>								
<b>Exp. No.</b>	<b>List of Experiments</b>							
1	Build and Test diode as a clipper and clamper							
2	Design and test a JFET/MOSFET CS amplifier for a given operating point.							
3	Single stage JFET/MOSFET CS amplifier							
4	Simulate frequency response of single stage BJT CE / JFET/MOSFET CS amplifier.							
5	Simulate Hartley /Colpitts oscillator							
6	Design and simulate RC Phase shift oscillator							
7	Build and test Current Series Feedback amplifier.							
8	Simulate Class A/ Class AB complementary symmetry Power Amplifiers.							
<b>PART B : Mini Project</b>								

1	Formation of Group, Finalization of Topic
2	Submission of Synopsis
3	Completion of Simulation
4	Completion of Hardware
5	Completion of Hardware

Self-learning: Choice of contents lies with course faculty with prior approval in course coordinator meeting.

**References:**

1. Boylestead&Nashelsky,—Electronic devices and Circuits Theoryl, PHI, 11th edition, 2022
2. Donald Neaman,—Electronic Circuit Analysis and Designl, Tata McGraw Hill, 3rd Edition,2016
3. S.Salivahanan,—Electronic Devices and Circuitsl ,Tata McGraw Hill, 2nd Edition, 2014
4. N.P. Deshpande, —Electronic Devices and Circuits Principles and Applications, Tata McGraw Hill, 1st Edition ,2009
5. Sedra and Smith— Microelectronics Circuits , Oxford University Press 2021,8<sup>th</sup> Edition
6. David A.Bell,—Electronic Device and Circuitsl, PHI, 5th Edition,2012
7. Jacob Millman, Christos C. Halkies, Chetan D. Parikh,—Integrated Electronics-Analog and Digital Circuits and Systems, Tata McGraw Hill , 2nd Edition,2016
8. Floyd,—Electronic Devicesl, Pearson, 10th Edition,2017.



<b>Program: B. Tech. (E&amp;TC)</b>					<b>Semester : III</b>			
<b>Course : Network Analysis</b>					<b>Code : BET23PC03</b>			
<b>Teaching Scheme (Hrs./Week)</b>					<b>Evaluation Scheme</b>			
<b>Credit</b>	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>TW</b>	<b>OR</b>	<b>PR</b>	<b>Total</b>
<b>2</b>	<b>–</b>	<b>4</b>	<b>–</b>	<b>1</b>	<b>100</b>	<b>–</b>	<b>-</b>	<b>100</b>
<p><b>Prior knowledge of:</b> Basic Electrical Engineering Concepts, Basic Network Theory Concepts, Basic Mathematical concepts such as a crammer's rule, first and second order differential equations, Laplace transform, etc.</p>								
<p><b>Course Objectives:</b></p> <ol style="list-style-type: none"> <li>To introduce the fundamentals of network simplification techniques and network theorems for linear circuits.</li> <li>To deliver the concepts related to fundamentals of network graph theory for resistive networks.</li> <li>To introduce the transient analysis of linear circuits like series RL, RC and RLC circuits using time as well as frequency domain analysis.</li> <li>To make students familiarize about the two port network parameters and network functions.</li> </ol>								
<p><b>Course Outcomes:</b> After completing the course, the students should be able to:</p> <ol style="list-style-type: none"> <li>Analyze the DC &amp; AC linear circuits for current, voltage or power using basic circuit simplification techniques and Network Theorems.</li> <li>Analyze the DC &amp; AC linear circuits for current, voltage or power using Network Theorems.</li> <li>Solve the given resistive network using graph theory for current, voltage or power.</li> <li>Analyze the responses of series RL, RC, RLC circuits using time domain method.</li> <li>Analyze the responses of series RL, RC, RLC circuits using frequency domain method.</li> <li>Determine the network parameters of two port networks and driving point, transfer functions for one port &amp; two port networks.</li> </ol>								
<p><b>General Guidelines:</b></p> <ul style="list-style-type: none"> <li>Use any EDA tool for simulation of above assignments from following: LTspice/PSpice/PSIM/NI MULTISIM/Circuit Maker/Proteus/etc</li> <li>For circuit analysis using Basic Circuit Simplification Techniques and Network Theorems consider DC as well as AC circuits.</li> </ul>								
<p><b>Detailed Syllabus:</b> Introduction: Basic Laws, Independent and dependent sources, their interconnection and power calculations. Network analysis: Mesh, Super-mesh, Node and Super-node analysis, Source transformation and source shifting. Superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, reciprocity theorem and Miller's Theorem. Network graph, tree, co-tree, and loops. Incidence matrix, tie-set, cut-set matrix. Formulation of equilibrium equations in matrix form, solution of resistive networks. Initial conditions, Analysis of source free and source driven series RL &amp; RC circuits for DC voltage source. Introduction to source free and source driven series RLC circuits for DC voltage source. Over damped, Under damped and critical damped series RLC circuit. Laplace transform equivalence of R, L &amp; C, Analysis of source free and source driven series RL, RC and RLC circuits or DC voltage source using Laplace transform. Terminal characteristics of network: Z, Y, h, ABCD Parameters; Reciprocity and Symmetry conditions, Applications of the parameters. Network functions for the one port and two port networks: Driving point and transfer functions, Poles and Zeros of Network functions, necessary conditions for stability and realizability of driving point &amp; transfer functions, Time domain behavior from Pole-Zero plot and Stability of network. Network analysis and Synthesis of Network Filters and Attenuators.</p>								
<b>Exp. No.</b>	<b>List of Experiments</b>							
1	Determine the Current, Voltage or Power for given linear circuits using mesh analysis, node analysis and other circuit simplification techniques.							

2	Determine the Current, Voltage or Power for given linear circuits using Network theorems.
3	1. Draw relevant network graph, tree, co-tree, and loops for given linear resistive network. 2. Formulate incidence matrix, tie-set, cut-set matrix whichever is applicable.
4	Formulate equilibrium equations in matrix form for a given linear resistive network and solve for loop, branch currents or node voltages using graph theory.
5	Carry out the transient analysis to determine the current and/or voltage for a given linear circuits (RL and RC circuits) using time domain method.
6	Carry out the transient analysis to determine the current and/or voltage for a given linear Circuits (RL and RC circuits) using frequency domain method.
7	Determine the z, y, h, ABCD parameters for a given network and/or find the conditions for Reciprocity and Symmetry.
8	Find the network transfer function for a given one port or two port networks using Laplace Transform and sketch the pole-zero plot to find network stability.
9	Mini Projects: Network Analysis and Synthesis of Filters and Attenuators and their simulations.

Self-learning: Choice of contents lies with course faculty with prior approval in course coordinator meeting.

**Reference Books:**

1. M. E. Van Valkenburg, Network Analysis, PHI / Pearson Education, 3rd edition. Reprint 2006.
2. Ravish Singh, Network Analysis and Synthesis, TMH, 2nd edition 2019.
3. William H Hayt, Jack E Kimmerly and Steven M. Durbin, Engineering Circuit Analysis, Tata McGraw Hill, 9th edition 2019.
4. D Roy Choudhury, Networks and Systems, New Age International Publishers, 2nd edition 2010.
5. Franklin F. Kuo, Network analysis and Synthesis, Wiley International Edition, 2nd edition 2006.
6. A.K. Chakraborty, S.P. Ghosh, Network Analysis and Synthesis, Tata McGraw Hill, 1st edition.

<b>Program :</b>	<b>B. Tech. (E&amp;TC)</b>				<b>Semester: III</b>			
<b>Course :</b>	<b>Signals and Systems</b>				<b>Code :BET23PC04</b>			
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior knowledge of :</b> Linear Algebra & Differential Calculus <b>is essential.</b>								
<b>Course Objectives:</b> This course aims at enabling students, To develop an understanding of students related to basic ideas of the Signals and system and their applications encountered in engineering.								
<b>Course Outcomes:</b> After learning the course, the students should be able to: <ol style="list-style-type: none"> <li>1. Classify the basic signals and perform operations on signals</li> <li>2. Classify the systems based on their properties and apply the concept of convolution.</li> <li>3. Analyze the signals in the frequency domain using the Fourier Transform Resolve the signals in the complex frequency domain using the Laplace Transform and basic concepts of the Z-transform</li> </ol>								
<b>Detailed Syllabus:</b>								
<b>Unit</b>	<b>Description</b>							<b>Duration [Hrs]</b>
<b>1</b>	<b>Introduction to Signals:</b> Representation of Standard signals, Classification of signals: Continuous-time and discrete-time signals, Periodic Signals and non-periodic, Power and energy signals, Causal signals and Non-causal signals. Operations on signals: Time shifting, Time reversal, Time scaling, Amplitude scaling, Signal addition, Subtraction, Signal multiplication.							<b>07</b>
<b>2</b>	<b>Introduction to System:</b> Classification of Systems: Continuous-time and Discrete-time systems, Linear and Non-Linear systems, Time variant and Time-invariant systems, Stable and Unstable systems, Causal systems, and non-causal systems. Convolution: Impulse response, Convolution and its properties, convolution integral and convolution sum using graphical method.							<b>07</b>
<b>3</b>	<b>Fourier Transform:</b> Complex exponential form of Fourier series, Fourier Transform (FT) representation of aperiodic continuous time (CT) signals, Dirichlet condition for existence of Fourier transform, evaluation of magnitude and phase response, FT of standard CT signals, Properties and their significance, Application of Fourier transform							<b>08</b>
<b>4</b>	<b>Laplace Transform and Z Transform:</b> Definition of Laplace Transform (LT), Limitations of Fourier transform and need of Laplace transform, ROC, Laplace transform of standard periodic and aperiodic functions, properties of Laplace transform and their significance, Inverse Laplace transform, stability considerations in S domain, Application of Laplace transforms. Z - Transform (ZT): Introduction to Z transform and its ROC.							<b>08</b>
	<b>Total</b>							<b>30</b>
Self-learning: Choice of contents lies with course faculty with prior approval in course coordinator meeting.								

**Text Books:**

1. A.V. Oppenheim, A.S. Willsky —Signals and systems, Prentice-Hall signal processing series. 2nd Edition, 2015
2. A. Nagoor Kanni —Signals and Systems, McGraw Hill, 2nd Edition, 2017

**Reference Books:**

1. B P Lathi —Linear Systems and Signals, Oxford University Press, Third Edition, 2017
2. Simon Haykins and Barry Van Veen —Signals and Systems, Wiley India, 2nd Edition. 2017
3. M.J. Roberts —Signal and Systems, Tata McGraw Hill, Third Edition ,2019.
4. Charles Phillips —Signals, Systems and Transforms, Pearson Education, 4th Edition. 2013
5. R. J. Beerends, H. G. ter Morsche —Fourier and Laplace Transforms, Cambridge University Press, 2003.
6. Shaila Dinkar Apte, Signals and System, [Cambridge University Press](https://www.cambridge.org/9780521876223), Edition 1, 2018

**Online courses Links:**

1. [https://onlinecourses.nptel.ac.in/noc23\\_ee14/preview](https://onlinecourses.nptel.ac.in/noc23_ee14/preview)
2. <https://www.classcentral.com/course/engineering-iitbombay-signals-and-systems-part-1-2679>



<b>Program: B. Tech. (E&amp;TC)</b>					<b>Semester : III</b>			
<b>Course : Signals and Systems Lab</b>					<b>Code : BET23PC05</b>			
Credit	Teaching Scheme (Hrs./Week)				Evaluation Scheme			
	Lecture	Practical	Tutorial	Other	TW	OR	PR	Total
1	–	2	–	1	25	–	25	50
<b>Prior knowledge of:</b> Linear algebra, MATLAB, and Simulink								
<b>Course Objectives:</b> To provide a thorough understanding and analysis of signals and systems using MATLAB.								
<b>Course Outcomes:</b> After completing the course, the students should be able to: <ol style="list-style-type: none"> <li>1. Generate and characterize various continuous and discrete-time signals and Perform the basic operations on the signals.</li> <li>2. Analyze linear time-invariant (LTI) systems and compute their response.</li> <li>3. Analyze the spectral characteristics of signals using Fourier analysis and analyze the systems using Laplace transform.</li> </ol>								
<b>General Guidelines:</b> Any Eight Experiments is to be performed to meet the above outcomes. Write MATLAB code								
Exp. No.	List of Experiments							
1	Generate Continuous time and discrete time standard signal.							
2	Perform signal operation: signal addition, Multiplication, time shifting, time scaling, and time inversion							
3	Plot the given signal and extract Energy and Power							
4	Compute the convolution integral of two signals (without using an inbuilt function)							
5	To plot the magnitude and phase response of a given CT signal using Fourier transform							
6	Plot the impulse response and pole-zero plot of the system transfer function using Laplace transform. Comment on the Stability of the system.							
7	Study of real-time signals using a virtual lab							
8	Design your own experiment to analyze any real-time signal using the concept/tools studied in the subject							
Self-learning: Choice of contents lies with course faculty with prior approval in course coordinator meeting.								
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. B P Lathi —Linear Systems and Signals, Oxford University Press, Third Edition, 2017</li> <li>2. Simon Haykins and Barry Van Veen —Signals and Systems, Wiley India, 2nd Edition. 2017</li> <li>3. Shaila Dinkar Apte, Signals and System, Cambridge University Press, Edition 1, 2018</li> <li>4. Luis F. Chaparro, Signals and Systems Using MATLAB, 3rd edition University of Pittsburgh; Academic Press, 2019, ISBN: 978-0-12-814204-2.</li> <li>5. Farzin Asadi , Signals and Systems with MATLAB® and Simulink®, Springer Edition 1, 2024</li> </ol>								



# **OEC -Mathematics Syllabus**

Since 1999

<b>Program:</b>	<b>B. Tech. (E&amp;TC)</b>				<b>Semester: III</b>			
<b>Course:</b>	<b>Computational Techniques (Suggested for E&amp;TC branch)</b>				<b>Code:</b>	<b>BSH23OE02</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
2	2	-	-	-	10	10	30	50
<b>Prior knowledge of:</b>								
<ol style="list-style-type: none"> <li>1. Univariate Calculus</li> <li>2. Multivariate Calculus is essential</li> </ol>								
<b>Course Objectives:</b>								
After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:								
<ol style="list-style-type: none"> <li>1. Statistical techniques, Probability theory and hypothesis techniques.</li> <li>2. Numerical techniques to approximate solutions for interpolation, integration and ordinary differential equations.</li> </ol>								
<b>Course Outcomes:</b>								
After learning the course, the students will be able to:								
<ol style="list-style-type: none"> <li>1. <b>Apply</b> descriptive statistical techniques to numerical data.</li> <li>2. <b>Analyse</b> random phenomena using probability theory and distributions.</li> <li>3. <b>Draw</b> inferences from data using hypothesis testing.</li> <li>4. <b>Find</b> approximate solutions for interpolation, integration and ordinary differential equations.</li> </ol>								
<b>Detailed Syllabus</b>								
<b>Unit</b>	<b>Description</b>							<b>Duration [Hrs]</b>
1	<b>Statistics:</b> Measures of Variability: Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting, Correlation and Regression.							7
2	<b>Probability Distributions:</b> Probability, Theorems on Probability, Random Variable, Probability mass function, Mathematical Expectation, Probability distributions: Binomial, Poisson, and Normal.							8
3	<b>Sampling Distribution:</b> Introduction and Types, Population vs Sample <b>Hypothesis Tests:</b> Level of significance, Confidence interval, p-Test, z-test, t-test, Chi-Square test, ANOVA Test.							7
4	<b>Numerical Methods:</b> <b>Interpolation:</b> Finite Differences, Newton's and Lagrange's interpolation formula. <b>Numerical Integration:</b> Trapezoidal and Simpson's rule <b>Ordinary differential equations:</b> Euler's, Modified Euler's and Runge-Kutta fourth order methods							8
<b>Total</b>							<b>30</b>	
<b>Text Books:</b>								
<ol style="list-style-type: none"> <li>1. Peter V. Neil, "Advanced Engineering Mathematics", Thomson Learning ,7 Edition, ISBN 13:9781337274524.</li> <li>2. B.V. Ramana , "Higher Engineering Mathematics", Tata McGraw-Hill, 34 edition, ISBN 13:9780070634190.</li> </ol>								
<b>Reference Books:</b>								
<ol style="list-style-type: none"> <li>1. M. D. Greenberg , "Advanced Engineering Mathematics", Pearson Education, 2 Edition, ISBN 13:9780486492797.</li> <li>2. B. S. Grewal , "Higher Engineering Mathematics", Khanna Publication, 42 Edition, ISBN 13:9788174091955.</li> <li>3. N. P. Bali, Manish Goyal, " A textbook of Engineering Mathematics", 9th Edition, ISBN 16:978-8131808320</li> <li>4. H. K. Das, "Advanced Engineering Mathematics", S Chand &amp; Company Ltd., 22 edition, ISBN 9352533836.</li> </ol>								
<b>e-sources:</b>								
<b>NPTEL Course lectures links:</b>								
<ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/112103001">Probability Theory for Data Science - Course (nptel.ac.in)</a> (Statistics, Probability and Hypothesis testing)</li> <li>2. <a href="https://nptel.ac.in/courses/112103002">Numerical methods - Course (nptel.ac.in)</a> (Numerical Methods)</li> </ol>								

<b>Program:</b>	<b>S. Y. B. Tech.</b>				<b>Semester: III</b>			
<b>Course:</b>	<b>Applied Mathematics (Suggested for Civil branch)</b>				<b>Code:</b>	<b>BSH23OE03</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
2	2	-	-	-	10	10	30	50
<b>Prior knowledge of:</b>								
1. Univariate Calculus 2. Multivariate Calculus <b>is essential</b>								
<b>Course Objectives:</b>								
After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:								
1. Statistical techniques, Probability theory, and Hypothesis techniques. 2. Higher level mathematics and their applications in Civil Engineering.								
<b>Course Outcomes:</b>								
After learning the course, the students should be able to:								
1. <b>Apply</b> descriptive statistical techniques to numerical data. 2. <b>Draw</b> inferences from data using probability theory and hypothesis testing. 3. <b>Find</b> approximate solutions for interpolation, integration and ordinary differential equations. 4. <b>Examine</b> the vector fields using concepts of vector differentiation and Integration.								
<b>Detailed Syllabus</b>								
<b>Unit</b>	<b>Description</b>							<b>Duration [Hrs]</b>
<b>1</b>	<b>Statistics:</b> Measures of Variability, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting, Correlation and Regression.							7
<b>2</b>	<b>Probability Distributions:</b> Probability, Theorems on Probability, Mathematical Expectation, Binomial, Poisson and Normal Distribution. <b>Hypothesis Test:</b> z-test, t-test, Chi-Square test, ANOVA Test.							8
<b>3</b>	<b>Numerical Methods:</b> <b>Interpolation:</b> Finite Differences, Newton's and Lagrange's interpolation formula <b>Numerical Integration:</b> Trapezoidal and Simpson's rule. <b>Ordinary differential equations:</b> Euler's, Modified Euler's and Runge-Kutta fourth order methods.							7
<b>4</b>	<b>Vector Differentiation:</b> Introduction, Vector differential operators, Gradient, Divergent, Curl, Directional Derivatives, Solenoidal and Irrotational fields, Scalar Potential. <b>Vector Integration and Applications:</b> Introduction to Line, Surface and Volume Integration of Vectors, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem.							8
<b>Total</b>							<b>30</b>	
<b>Text Books:</b>								
1. Peter V. Neil, "Advanced Engineering Mathematics", Thomson Learning, 7 Edition, ISBN 13:9781337274524. 2. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, 34 edition, ISBN 13:9780070634190.								
<b>Reference Books:</b>								
1. M. D. Greenberg, "Advanced Engineering Mathematics", Pearson Education, 2 Edition, ISBN 13: 9780486492797 2. S.R.K. Iyengar, Rajendra K. Jain, "Advanced Engineering Mathematics", Alpha Science International, Ltd, 4 Edition, ISBN 13: 9781842658468 3. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, 42 Edition, ISBN 13: .9788174091955 4. N. P. Bali, Manish Goyal, "A textbook of Engineering Mathematics", 9th Edition, ISBN 16:978-8131808320								
<b>e-sources:</b>								
1. NPTEL Course lectures links: <a href="https://nptel.ac.in/courses/111/105/111105090/">https://nptel.ac.in/courses/111/105/111105090/</a> (Probability) <a href="https://onlinecourses.nptel.ac.in/noc20_ma13/">https://onlinecourses.nptel.ac.in/noc20_ma13/</a> (Advanced Engineering Mathematics)								
2. V-lab (IIT-Bombay) link: <a href="http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/explist.php">http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/explist.php</a>								

<b>Program:</b>	<b>S.Y.B. Tech.</b>				<b>Semester: IV</b>			
<b>Course:</b>	<b>Computational Techniques (Suggested for Comp/Comp R/IT branch)</b>				<b>Code:</b>	<b>BSH24OE07</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
02	2	-	-	1	10	10	30	50
<b>Prior knowledge of:</b>								
<ol style="list-style-type: none"> <li>Univariate Calculus</li> <li>Multivariate Calculus</li> </ol>								
<b>Course Objectives:</b>								
After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:								
<ol style="list-style-type: none"> <li>Statistical techniques, Probability theory and hypothesis techniques.</li> <li>Different mathematical approaches for optimization.</li> </ol>								
<b>Course Outcomes:</b>								
After learning the course, the students should be able to:								
<ol style="list-style-type: none"> <li><b>Apply</b> descriptive statistical techniques to numerical data.</li> <li><b>Analyze</b> random phenomena using probability theory and distributions.</li> <li><b>Draw</b> inferences from data using hypothesis testing.</li> <li><b>Apply</b> optimization techniques in transportation and assignment problems.</li> </ol>								
<b>Detailed Syllabus</b>								
<b>Unit</b>	<b>Description</b>							<b>Duration [Hrs]</b>
1	<b>Statistics:</b> Measures of Variability: Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting (line, parabola & exponential curves), Correlation and Linear Regression.							7
2	<b>Probability Distributions:</b> Probability, Theorems on Probability, Random Variable, Probability mass function, Mathematical Expectation, Probability distributions: Binomial, Poisson, and Normal.							8
3	<b>Sampling Distribution:</b> Introduction and Types, Population vs Sample <b>Hypothesis Tests:</b> Level of significance, Confidence interval, p-Test, z-test, t-test, Chi-Square test, ANOVA Test.							7
4	<b>Transportation Problems:</b> Introduction, Mathematical model of transportation problem, Methods of finding initial solutions: North-west Corner rule, least cost method, VOGEL's approximation method, Optimality of initial solution using MODI Method. <b>Assignment Problems:</b> Introduction, Mathematical model of Assignment problem, solutions to Assignment problems using Hungarian method.							8
<b>Total</b>							<b>30</b>	
<b>Text Books:</b>								
<ol style="list-style-type: none"> <li>Peter O'Neil, "Advanced Engineering Mathematics", Thomson Learning, 7 Edition, ISBN 13:9781337274524.</li> <li>B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, 34 edition, ISBN 13:9780070634190.</li> </ol>								
<b>Reference Books:</b>								
<ol style="list-style-type: none"> <li>M. D. Greenberg, "Advanced Engineering Mathematics", Pearson Education, 2 Edition, ISBN 13:9780486492797.</li> <li>B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, 42 Edition, ISBN 13:9788174091955.</li> <li>N. P. Bali, Manish Goyal, "A textbook of Engineering Mathematics", 9th Edition, ISBN 16:978-8131808320</li> <li>H.K. Das, "Advanced Engineering Mathematics", S Chand &amp; Company Ltd, 22 edition, ISBN 9352533836</li> </ol>								
<b>e-sources:</b>								
<b>NPTEL Course lectures links:</b>								
<a href="https://nptel.ac.in/courses/110/106/110106059/">Probability Theory for Data Science - Course (nptel.ac.in)</a> (Statistics, Probability and Hypothesis testing) <a href="https://nptel.ac.in/courses/110/106/110106059/">https://nptel.ac.in/courses/110/106/110106059/</a> (Transportation&AssignmentsProblems)								

<b>Program:</b>	S.Y. B.Tech.CSE(AI&ML).					<b>Semester:IV</b>		
<b>Course:</b>	OE-Mathematics-Mathematical Optimization(Suggested for AI & ML branch)					<b>Code:</b>	BSH24OE08	
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
<b>2</b>	<b>2</b>	-	-	-	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior knowledge of:</b>								
1. Univariate Calculus and Multivariate Calculus is essential								
<b>Course Objectives:</b>								
After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to:								
1. Different mathematical approaches for optimization.								
2. Commonly used tools and techniques in network analysis								
<b>Course Outcomes:</b>								
After learning the course, the students should be able to:								
1. Solve Linear Programming Problems using graphical and simplex methods.								
2. Apply optimization techniques in transportation and assignment problems.								
3. Analyze project networks using Critical Path Method and Project Evaluation & Review Techniques.								
4. Apply numerical methods for optimal solutions of constrained, unconstrained linear and nonlinear programming problems.								
<b>Detailed Syllabus</b>								
<b>Unit</b>								<b>Duration [Hrs]</b>
1	<b>Linear Programming (LP):</b> Introduction, formulation of Linear Programming problems, Graphical solution method, multiple optimal solutions, Unbounded solutions, Infeasible solutions, Simplex Method.							<b>8</b>
2	<b>Transportation Problems:</b> Introduction, Mathematical model of transportation problem, methods of finding initial solutions: North-west Corner rule, Least cost method, VOGEL's approximation method, Optimality of initial solution using MODI Method. <b>Assignment Problems:</b> Introduction, Mathematical model of Assignment problem, solutions to Assignment problems using Hungarian method.							<b>7</b>
3	<b>Network Analysis:</b> Network Diagram, Project Management: PERT and CPM, Critical path analysis, Project scheduling with uncertain activity time, and Project time-cost.							<b>8</b>
4	<b>Unconstrained optimization:</b> One-dimensional search methods, Gradient-based methods, Hessian Matrix Method <b>Constrained Optimization:</b> Lagrange theorem, Kuhn Tucker Method.							<b>7</b>
<b>Total</b>							<b>30</b>	
<b>Text Books:</b>								
1. Rao S. S., Engineering Optimization Theory and Practice, Willy Eastern Ltd.4 <sup>th</sup> Edition, ISBN: 978-0-470-18352-6								
2. Taha Hamdy, Operation Research: An Introduction, Pearson Education, 9th Edition, ISBN:0134444019								
<b>Reference Books:</b>								
1. Sharma S.D. Operation Research, Kedarnath Ramnath & Co. Edition, ISBN:9380803389								
2. Peter. O' Neil, "Advanced Engineering Mathematics," Thomson Learning, 7 Edition, ISBN13: 9781337274524								
3. Hira Gupta, "Operation Research," S.Chand Publication, ISBN(13):9788121909686.								
4. Sharma J.K. "Operations Research-Theory and Applications," Trinity Press, 6 Edition ISBN:9789385935145								

**E-sources:** NPTEL Course lectures links:

1. <https://nptel.ac.in/courses/111/102/111102012/>(LPP)
2. <https://nptel.ac.in/courses/110/106/110106059/>(Transportation&Assignments Problems)



<b>Program:</b>	S. Y. B. Tech.				<b>Semester: III</b>			
<b>Course:</b>	Applied Mathematics (Suggested for Mechanical branch)				<b>Code:</b>	BSH23OE01		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
2	2	--	--	--	10	10	30	50
<b>Prior knowledge of:</b> Univariate Calculus, Multivariate Calculus								
<b>Course Objectives:</b> After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to: 1. Statistical techniques and Probability theory for Data Analysis. 2. Partial differential equations applied to mechanical engineering problems such as mechanical vibrations and heat transfer. 1. Laplace Transform and Inverse Laplace Transform applied to solve linear differential equations.								
<b>Course Outcomes:</b> After learning the course, the students should be able to: 1. <b>Apply</b> descriptive statistical techniques to numerical data. 2. <b>Draw</b> inferences from data using probability theory and hypothesis testing. 3. <b>Solve</b> wave, heat and Laplace equations using separation method. 4. <b>Find</b> Laplace and Inverse Laplace Transform for piecewise continuous function and solution of linear differential equations.								
<b>Detailed Syllabus</b>								
<b>Unit</b>	<b>Description</b>							<b>Duration [Hrs]</b>
1	<b>Statistics:</b> Measures of Variability: Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting, Correlation and Regression.							7
2	<b>Probability Distributions:</b> Probability, Theorems on Probability, Mathematical Expectation, Binomial, Poisson, and Normal Distributions. Hypothesis Test: z-test, t-test, Chi-Square test, ANOVA Test.							8
3	<b>Applications of Partial Differential Equations:</b> Solution to One dimensional Wave, Heat and Transport equation, Two-dimensional heat flow equation using Method of separation of variables.							7
4	<b>Laplace Transform:</b> Introduction, Laplace Transform of some standard and special functions, Region of convergence and Properties, properties and theorems of Laplace Transformation. Inverse Laplace Transform, Application of Laplace Transform to solve LDE.							8
Total							30	
<b>Text Books: Text Books:</b> 1. Peter O'Neil, "Advanced Engineering Mathematics", Thomson Learning, 7 Edition, ISBN 13:9781337274524. 1. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, 34 edition, ISBN 13:9780070634190.								
<b>Reference Books:</b> 1. Erwin Kreyszig, "Advanced Engineering Mathematics" Wiley Eastern Ltd., 10 Edition, ISBN 13: 9780470458365. 2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, 42 Edition, ISBN 13:9788174091955. 3. N. P. Bali, Manish Goyal, "A textbook of Engineering Mathematics", 9th Edition, ISBN 16:978-8131808320. 1. H.K. Das, "Advanced Engineering Mathematics", S Chand & Company Ltd, 22 edition, ISBN 9352533836.								
<b>e-sources:</b> <b>NPTEL Course lectures links:</b> 1. <a href="https://onlinecourses.nptel.ac.in">Probability Theory for Data Science - Course (nptel.ac.in)</a> (Statistics, Probability and Hypothesis testing) 2. <a href="https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_ma54">https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_ma54</a> (Laplace Transform)								



# **OEC-Department Specific Course Syllabus**

<b>Program:</b>	<b>S.Y.B. Tech. (E&amp;TC)</b>				<b>Semester: III</b>			
<b>Course:</b>	<b>Neural Network and Fuzzy Logic Control</b> (OE –Department Specific) (Offered by AS&H)				<b>Code:</b>	<b>BSH23OE06</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
2	2	-	-	-	10	10	30	50
<b>Prior Knowledge: Nil</b>								
<b>Course Objectives:</b>								
<ol style="list-style-type: none"> <li>To provide knowledge of Neural Networks and apply them for modelling and controlling real-time dynamic systems.</li> <li>To apply fuzzy logic techniques for solving various engineering and decision-making problems.</li> </ol>								
<b>Course Outcomes:</b>								
After learning the course, the students will be able to:								
<ol style="list-style-type: none"> <li><b>Describe</b> learning rules, activation functions and basics of neural networks.</li> <li><b>Implement</b> backpropagation and optimizer algorithms for weight updates of Neural Network.</li> <li><b>Apply</b> fuzzy set concepts for fuzzification and defuzzification.</li> <li><b>Perform</b> Mamdani and Sugeno fuzzy inference system in real world problems.</li> </ol>								
<b>Detailed Syllabus</b>								
<b>Unit</b>	<b>Description</b>							<b>Duration [Hrs]</b>
1	<b>Architecture of Neural Network:</b> Introduction; biological neural networks; artificial neural networks; architecture of artificial neural networks—bias, activation functions, learning methods, and learning rules; types of neural networks such as single-layer, multi-layer, feedforward, and recurrent neural networks.							7
2	<b>Neural Networks for Control:</b> Loss functions; weight initialization; optimization algorithms; backpropagation algorithm; associative memory networks and their types; discrete-time Hopfield networks.							8
3	<b>Fundamentals of Fuzzy Logic:</b> Classical sets; fuzzy sets; membership functions; cardinality of fuzzy sets; fuzzy complement; fuzzy composition; properties and operations on fuzzy sets; fuzzy relations; fuzzification; and defuzzification.							7
4	<b>Fuzzy Logic Control:</b> Fuzzy rules; decision-making logic; linguistic variables; fuzzy inference systems including Mamdani FIS and Sugeno FIS; design of fuzzy controllers; fuzzy optimization; and applications of FIS to real-life problems.							8
<b>Total</b>							<b>30</b>	
<b>Text Books:</b>								
<ol style="list-style-type: none"> <li>Kosko, B, “Neural Networks and Fuzzy Systems: A Dynamical Approach to Machine Intelligence”, Prentice Hall, NewDelhi, 2004.</li> <li>Ross T. J., “Fuzzy logic with engineering applications (Vol. 2)”, New York: Wiley, 2004, ISBN: 9783030375478</li> </ol>								
<b>Reference Books:</b>								
<ol style="list-style-type: none"> <li>Jack M. Zurada, “Introduction to Artificial Neural Systems,” PWS Publishing Co., Boston, 2002.</li> <li>Zimmerman H.J., “Fuzzy set theory and its Applications,” Kluwer Academic Publishers Dordrecht,2001.</li> <li>Driankov, Hellendroonb, “Introduction to fuzzy control,” Narosa Publishers,2001.</li> <li>G Klir, B Yuan, “Fuzzy sets and fuzzy logic: Theory and application,” PHI, ISBN:</li> <li>LauranceFausett, Englewood Cliffs, N.J., “Fundamentals of Neural Networks,” PearsonEducation, New Delhi, 2008.</li> <li>B Yegnanarayana: Artificial Neural Networks for pattern recognition, PHI Learning Pvt. Ltd., 14- Jan-2009</li> </ol>								
<b>E-sources:</b>								
Online course “Fuzzy Logic and Neural Network” by Prof. Dilip Kumar Pratihari, IIT Kharagpur. <a href="https://nptel.ac.in/courses/127/105/127105006/">https://nptel.ac.in/courses/127/105/127105006/</a>								

<b>Program:</b>	<b>B. Tech. (E&amp;TC)</b>			<b>Semester :</b>	<b>III</b>		
<b>Course:</b>	<b>Total Quality Management (OEC-Department Specific Course offered by Civil Department)</b>			<b>Code:</b>	<b>BCI23OE02</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs/Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior Knowledge:</b> Basic definitions of Quality and importance of Quality in industry for safety and durability.							
<b>Course Objectives:</b> After Completing this course, student will have adequate background : 1. To understand the importance of Quality in construction. 2. To understand the need of Total Quality management & it's tools. 3. To understand role of ISO in quality management.							
<b>Course Outcomes:</b> After learning the course, the students should be able to: 1. Articulate quality and quality ideas as presented by many gurus and philosophers after learning. 2. Illustrate different quality control tools. 3. Apply ISO concepts and the cost of quality to quality assurance. 4. Analyze various techniques of TQM.							
<b>Detailed Syllabus</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration (H)</b>
<b>1</b>	<b>Unit I: Quality in Construction</b> a) Quality – Various definitions and interpretation. Importance of quality on a project in the context of global challenges, Factors affecting quality, Reasons for poor quality & measures to overcome, Contribution of various Quality Gurus (Juran, Deming, Crossby, Ishikawa), b) Evolution of TQM- QC, TQC, QA, QMS, TQM.						<b>7</b>
<b>2</b>	<b>Unit II: TQM, Six Sigma and QC tools</b> a) TQM – Necessity, advantages, Quality Function Deployment (QFD), b) Six sigma – Importance, levels, Application of 6 Sigma, c) Implementation of 7 QC tools through case study.						<b>8</b>
<b>3</b>	<b>Unit III: Cost of Quality and ISO</b> a) Categories of cost of Quality, b) Study of ISO 9001 principles., Quality manual – Importance, contents, documentation, Corrective and Preventive actions, Conformity and NC reports.						<b>7</b>
<b>4</b>	<b>Unit IV: Techniques in TQM Implementation</b> a) Benchmarking in TQM, Kaizen in TQM, b) '5-S' techniques, Zero Defects, c) Quality Circle Concept and applications through Quality Circle Formation.						<b>8</b>
<b>Total</b>							<b>30</b>
<b>Text Books:</b> 1. Total Quality Management-- Dr. Gunmala Suri and Dr. Puja Chhabra Sharma—Biztantra. 2. Quality Control and Total Quality Management by P.L.Jain- Tata McGraw Hill Publ. 3. Total Quality Management - Dr. S.Rajaram and Dr. M. Sivakumar—Biztantra. 4. Total Engineering Quality Management – Sunil Sharma – Macmillan India Ltd.							
<b>Reference Books:</b> 1. Juran’s Quality Handbook – Juran Publication. (2016 Edition) 2. Management –Principal, process and practices by Bhat – Oxford University Press.(2008) 3. Financial management by Shrivastava- Oxford University Press (6th Edition 2022) 4. Management Information Systems – Gordon B. Davis, Margrethe H. Olson – Tata McGraw Hill Publ. Co. (2022) 5. Total Project Management – The Indian Context - P.K.Joy Macmillan India Ltd.							

<b>Program:</b>	<b>B. Tech. (E&amp;TC)</b>			<b>Semester:</b>		<b>III</b>	
<b>Course:</b>	<b>Building Services and Maintenance</b> (OEC-Department Specific Course offered by Civil Department)			<b>Code:</b>		<b>BCI23OE03</b>	
<b>Credits</b>	<b>Teaching Scheme (Hrs/Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior Knowledge:</b> NA							
<b>Course Objectives:</b> This course aims at enabling students, 1. To impart knowledge about the building services 2. To examine the purpose and type of building maintenance.							
<b>Course Outcomes:</b> After learning the course, the students should be able to: 1. Understand different building services provisions. 2. interpret the fundamental concepts relevant to functional requirement of building. 3. Relate the knowledge of Acoustic and Fire Protection. 4. Choose diverse maintenance methodologies applicable to building and infrastructure services.							
<b>Detailed Syllabus</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration (H)</b>
<b>1</b>	<b>Introduction to Building Services:</b> Definitions, Objective and uses of services, different types of building, Classification of based on Occupancy, FSI, Carpet area, built-up area, Standard of Accommodation, Classification of building services, Types of services and selection of appropriate services for given project, case studies.						7
<b>2</b>	<b>Escalator and Plumbing-</b> Classification of different types of escalators, Lift codes and Rules, Design Features of Escalator, Plumbing- Common Sanitary Fixtures, Layout of Sanitary Fixtures, Water Pipe Sizing in Buildings, Building Services Detailing, Rain Water Harvesting, Sanitation in buildings.						8
<b>3</b>	<b>Acoustics and Ventilation-</b> Material properties, acoustical design of assembly halls and buildings, noise and its control, measuring equipment, Ventilation- Ventilation systems, health and comfort ventilation, Fire protection and National Building Codes 2016- requirements, equipment and their applications, security systems.						8
<b>4</b>	<b>Building Maintenance:</b> Role of maintenance in durability and serviceability of structures, Economic aspects of maintenance, Different types of maintenance and audits process. <b>Infrastructures services:</b> Different types of structures, infrastructure services, case studies.						7
<b>Total</b>						<b>30</b>	
<b>Text Books:</b> 1. Building Construction Dr. B. C. Punmia Laxmi Publications (P) Ltd., New Delhi 2. Building Construction P. C. Varghese PHI Learning (P) Ltd., New Delhi 3. Building repair and Maintenance Management P. S. Gahlot CBS Publishers & Distribution(P) Ltd.							
<b>Reference Books:</b> 1. Building Science & Planning by S.V. Deodhar, Khanna Publishers. 2. Design and Practical Hand Book on Plumbing by C.R Mohan, VivekAnand, Standard Publishers Distributors. 3. Hand book of Designing and Installation of Services in High Rise Building Complexes, by V.K. Jain, Khanna Publ							

<b>Program:</b>	<b>B. Tech. ( E&amp;TC)</b>					<b>Semester: III</b>	
<b>Course:</b>	<b>Fundamentals of Database Management System</b> (OEC-Department Specific Course offered by Computer Department)					<b>Code: BCE23OE01</b>	
<b>Credit</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
<b>02</b>	<b>02</b>	-	-	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior knowledge of basics Mathematics is essential</b>							
<b>Course Objectives:</b>							
<ol style="list-style-type: none"> <li>1. To make students understand the fundamental concepts of database management.</li> <li>2. To provide a foundation in database concepts.</li> <li>3. To make students familiar with building database design.</li> <li>4. To make students understand SQL queries and concepts.</li> </ol>							
<b>Course Outcomes:</b>							
After learning the course, the students will be able to:							
<ol style="list-style-type: none"> <li>1. Understand the fundamental concepts of database management systems.</li> <li>2. Design E-R Model for given requirements and convert the same into database tables.</li> <li>3. Design schema in appropriate normal form considering requirements.</li> <li>4. Use SQL to write queries for given requirements.</li> </ol>							
<b>Detailed Syllabus</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration (H)</b>
1	Introduction to Database Management Systems, Purpose of Database Systems, Database-System Applications, View of Data, Database System Structure.						6
2	Data Models, Database Design, Entity Relationship Model, ER Diagram, Extended ER diagram, converting E-R and Extended ER diagram into tables.						8
3	Relational Model: Basic concepts, CODD's Rules, Relational Integrity: Domain, Referential Integrities Database Design: Features of Good Relational Designs, Normalization, Atomic Domains, and First Normal Form, 2NF, 3NF, BCNF.						8
4	SQL Language commands DDL, DML, DCL SQL: Characteristics and advantages, SQL Data Types, SQL Operators, Tables: Creating, Modifying, Deleting, Updating, DML Queries: SELECT Query and clauses, SQL - Ordering of Tuples, Aggregate Functions, SQL Functions, Sub queries						8
<b>Total</b>						<b>30</b>	
<b>Text Books:</b>							
<ol style="list-style-type: none"> <li>1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, 7th Edition, 2020, ISBN 978-0-07-802215-9.</li> <li>2. Ivan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB Publications, 2014 ISBN: 9788176569644.</li> <li>3. Connally T, Begg C., "Database Systems- A Practical Approach to Design, Implementation and Management", Pearson Education, 5th Edition, 2010, ISBN 81-7808-861-4.</li> </ol>							
<b>Reference Books:</b>							
<ol style="list-style-type: none"> <li>1. Coronel, C. and S. Morris, —Database Systems: Design, Implementation, &amp; Management,  12th edition, Cengage, 2016</li> <li>2. S. K. Singh, "Database Systems: Concepts, Design and Application", Pearson Education, 2009, ISBN 9788177585674</li> </ol>							
<b>e-sources:</b> <a href="http://w3schools.org/">http://w3schools.org/</a>							

<b>Program:</b>	B. Tech. (E&TC)			<b>Semester: III</b>			
<b>Course:</b>	Principles of Software Engineering (OEC-Department Specific Course offered by Computer Department)				<b>Code: BCE23OE02</b>		
<b>Credit</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
<b>02</b>	<b>02</b>	<b>-</b>	<b>-</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>

**Prior knowledge of problem-solving skills is essential.**

**Course Objectives:**

1. To introduce the fundamental phases of the Software Development Life-cycle (SDLC).
2. To make students understand the methods for capturing, specifying, and analyzing software requirements.
3. To make students understand the concept of UML Diagrams for software project development.
4. To provide the fundamental understanding of the agile process model.

**Course Outcomes:**

After learning the course, the students will be able to:

1. Compare and Select appropriate Software Development Life-cycle (SDLC) Process Model.
2. Comprehend methods for capturing, specifying, and analyzing software requirements.
3. Design UML Diagrams for software project development.
4. Comprehend the basics of agile process model for the development of software projects.

**Detailed Syllabus**

<b>Unit</b>	<b>Description</b>	<b>Duration (H)</b>
1	<b>Introduction to Software Engineering :</b> Definition of Software, Software Application Domains, Software engineering layers, Software engineering practice, The Essence of Practice, General Principles, Software Development Life Cycle (SDLC) Models: Waterfall Model, V Model, Incremental Process Model, Evolutionary Process Models, Unified Process, Phases of the Unified Process. Case Study: Safe Home	8
2	<b>Requirements Analysis :</b> Requirement Engineering, Requirements engineering tasks, Establishing the Groundwork-Eliciting Requirements, Collaborative Requirements Gathering, Quality Function Deployment, Usage Scenarios, Elicitation Work Products, Developing use cases, Software requirements document. Case Study: Safe Home	7
3	<b>Software Design &amp; Modeling Concepts:</b> Design Concepts, Design Process and Design Quality, Design Models, Modeling Concepts and Diagrams, Introduction to UML, Use Case Diagrams, Class Diagrams, Activity Diagrams, Deployment Diagrams.	8
4	<b>Agile development Process:</b> Agile Process- Extreme Programming in agile development, Agile software development process Models, SCRUM – process flow, scrum roles, scrum cycle description, product backlog, sprint planning meeting, sprint backlog, sprint execution, daily scrum meeting.	7
<b>Total</b>		<b>30</b>

**Text Books:**

1. Roger S Pressman, "Software Engineering – A Practitioner's Approach", Pearson Education, 9th Edition, ISBN 9789355325044, 2023.
2. Ian Sommerville, "Software Engineering", 10th edition, ISBN-13: 9780137503148, 2021.
3. Unified Modeling Language User Guide, The (2nd Edition) (Addison-Wesley Object Technology Series), ISBN:978-0-321-26797-9, May 2005.

**Reference Books:**

1. Carlo Ghezzi, "Fundamentals of Software Engineering", Prentice Hall India, ISBN 10: 0133056996, 2002.
2. Rajib Mall, "Fundamentals of Software Engineering", Prentice Hall India, ISBN 13: 978-8120348981, 2014.
3. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer, ISBN 13: 9788173192715, 2010.

e-sources: <http://w3schools.org/>

<b>Program:</b>	<b>B. Tech. (E&amp;TC)</b>					<b>Semester: III</b>	
<b>Course:</b>	<b>Android App Development with Kotlin</b> (OEC-Department Specific Course offered by Computer Department)					<b>Code: BCE23OE03</b>	
<b>Credit</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
<b>02</b>	<b>02</b>	-	-	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior knowledge of</b> Basic programming knowledge is essential							
<b>Course Objectives:</b>							
<ol style="list-style-type: none"> <li>1. To explore Kotlin programming language features.</li> <li>2. To familiarize with the concepts of Kotlin.</li> <li>3. To get acquainted with Android features, networks, and data handling techniques.</li> <li>4. To develop an Android app with testing.</li> </ol>							
<b>Course Outcomes:</b>							
After learning the course, the students will be able to: <ol style="list-style-type: none"> <li>1. Explore object-oriented programming with Kotlin.</li> <li>2. Illustrate the concept of Kotlin fundamentals</li> <li>3. Apply the network handling and Android UI techniques.</li> <li>4. Deploy the Android application with testing.</li> </ol>							
<b>Detailed Syllabus</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration (H)</b>
1	<b>Introduction to Kotlin programming language</b> Introduction to Kotlin programming language, Setting up Android Studio development environment, Basics of Kotlin syntax and basic programming concepts, Variables, data types, and operators in Kotlin.						6
2	<b>Kotlin fundamentals</b> Conditional statements, Loops, Functions, parameters, Kotlin collections, Classes and objects, Properties, fields, and methods, Inheritance, polymorphism, and interfaces, Data classes and sealed classes.						9
3	<b>Android architecture, Android UI and Networking</b> Android Architecture, Activities and life cycle, Views, View groups, fragments and lifecycle, Working with RESTful APIs and JSON data, Using Retrofit and OkHttp for network communication, Implementing LiveData and ViewModel, Asynchronous programming.						9
4	<b>Android App Development and Testing</b> Case study: Picture gallery, Developing an App, Unit testing and UI testing with Junit and Espresso, Preparing and publishing app to Google Play store						6
<b>Total</b>						<b>30</b>	
<b>Text Books:</b>							
<ol style="list-style-type: none"> <li>1. Laurence PO, Hinchman-Dominguez A, G. Blake Meike, Dunn M. "Programming Android with Kotlin", O'Reilly Media, Inc.; 2021. ISBN:9781492063001</li> <li>2. Lim G. "Beginning Android Development With Kotlin" Greg Lim; 2020. ISBN:9811477973, 9789811477973</li> </ol>							
<b>Reference Books:</b>							
<ol style="list-style-type: none"> <li>1. Trivedi Hardik. "Android application development with Kotlin", BPB Publications; 2020.</li> <li>2. Fazio M. "Kotlin and Android Development featuring Jetpack", Pragmatic Bookshelf; 2021.</li> </ol>							
<b>e-sources:</b> 1. <a href="https://developer.android.com/">https://developer.android.com/</a>							

<b>Program:</b>	<b>B. Tech.</b>				<b>Semester: III</b>			
<b>Course:</b>	<b>AI for Financial Modelling (offered by CSE-AI&amp;ML) (Open Elective- Department Specific)</b>				<b>Code:</b>	<b>BCS23OE01</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
02	02	-	-	-	10	10	30	50

**Prior knowledge of financial concepts, basics of Excel is essential.**

**Course Objectives:**

1. To understand the essentials of financial modeling
2. To learn to build a simple financial model.
3. To perform the analyses of financial models and Apply AI/ML methods for forecasting.
4. To use AI enabled platforms for finance tasks

**Course Outcomes:**

After learning the course, the students will be able to :

1. Learn the essentials of financial modeling
2. Understand core AI and machine learning concepts and algorithms relevant to finance.
3. Apply AI/ML methods for financial forecasting.
4. Use AI enabled tools and platforms for finance tasks

**Detailed Syllabus**

<b>Unit</b>	<b>Description: Times new Roman- Font size-11</b>	<b>Duration [Hrs]</b>
1	<b>Introduction to Financial Modelling :</b> Importance and Applications in Finance, Key Financial Statements (Income Statement, Balance Sheet, Cash Flow), Basic Excel Techniques for Financial Modelling, Overview of Financial Ratios and KPIs, Limitations of Traditional Modelling Techniques.	7
2	<b>Basics of Artificial Intelligence and Machine Learning:</b> Introduction to AI and Machine Learning, Types of Machine Learning (Supervised, Unsupervised), Common Algorithms in Finance: Linear Regression, Decision Trees, Clustering, Introduction to Python for AI (basics, IDEs, libraries: NumPy, Pandas), Data Preprocessing for Financial Datasets.	8
3	<b>AI Applications in Financial Modelling:</b> AI for Forecasting Revenue and Expenses, AI for Credit Risk Assessment across financial applications, AI in Fraud Detection, Portfolio Optimization Basics, Predictive Analytics in Budgeting and Planning.	8
4	<b>Tools, Ethics, and Future Trends :</b> AI Tools for Finance: Power BI/Tableau, AutoML Platforms, Introduction to FinTech and Robo-Advisors, Ethical Considerations: Data Privacy, Bias, Model Interpretability. Case Studies of AI in Financial Services	7
<b>Total</b>		<b>30</b>

**TextBooks:**

1. Yves Hilpisch, "Artificial Intelligence in Finance: A Python-Based Guide", O'Reilly Media Inc., July 2019, ISBN: 9781492055433
2. Jannes Klaas, "Machine Learning for Finance", Packt Publishing, 2019, ISBN: 9781789136364

**Reference Books:**

1. Edward P.K.Tsang, "AI for Finance", Routledge Taylor and Francis, 1st Edition, 2023, ISBN 9781032384436 .

**Web References:**

1. <https://www.udemy.com/course/python-and-machine-learning-in-financial-analysis/>  
<https://www.udemy.com/course/ai-for-finance/>

<b>Program</b>	<b>B. Tech. (ENTC)</b>			<b>Semester</b>	<b>III</b>		
<b>Course</b>	<b>Cyber Security: Understanding Cyber Crimes and Legal Perspectives</b> (OEC-Department Specific Course offered by IT Department)			<b>Code</b>	<b>BIT23OE02</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA 1</b>	<b>FA 2</b>		
<b>2</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior knowledge of:</b> 1. Fundamentals of the Internet <b>is essential.</b>							
<b>Course Objectives:</b> 1. To learn the concepts of cyber security for understanding and addressing digital threats effectively. 2. To learn about legal frameworks governing information technology and cyber law.							
<b>Course Outcomes:</b> After learning the course, the students will be able to: 1. Explain the principles and necessity of cyber security 2. Categorize various cyber threats, cybercrimes, and cyber legal frameworks. 3. Apply cyber forensic techniques to identify criminal activities. 4. Use preventative measures to stop social engineering scams.							
<b>Detailed Syllabus</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration (Hrs)</b>
1.	<b>Introduction to Cyber Security</b> Cyber Security – History of Internet– Impact of Internet; Reason for Cyber Crime – Need for Cyber Security; History of Cyber Crime, Cyber Security Concepts: Introduction to cyber security, Types of cyber security, Information Assurance Fundamentals, Attacker Techniques and Motivations, Cyber security Challenges, Incident response process, Security policy, Risk Analysis and Management, CIA Triad						8
2.	<b>Cyber Crime and Law</b> Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes, Planning cyber-attacks by cybercriminals, Careers in Cyber Security. Cyber Laws—The Indian IT Act— Cyber Crime and Punishment. Types of Threats, Types of Hacker, Hacking and Cracking, Hacking: Ethical issues, Ethical Hacking.						8
3.	<b>Cyber Forensics</b> Introduction to Cyber Forensics: Cyber forensics investigation process, digital evidence, challenges in cyber forensics; Types of forensics, Anti- forensics practices, Anti-forensics detection techniques. Email Forensics: e-mail Protocols, email crimes, email forensics;						7
4.	<b>Social Engineering</b> Introduction of social engineering and cyber security, Evolution of Social Engineering, Social Engineering Ethics, Purpose , Prevention methods, Insider attacks, defining social engineering- categories, Phases, attack spiral model, Attack Vendors-social approach, socio-technical approach. Identity Theft, Preventing Insider Threats,						7
	<b>Total</b>						<b>30</b>
<b>Text Books:</b> 1. Nina Godbole and Sunil Belapure. Cyber Security: Understanding Cyber Crimes, Computer Forensics, and Legal Perspectives, Wiley INDIA. ISBN 978-81-265-2179-1. 2. Niranjan Reddy, Practical Cyber Forensics an Incident-Based Approach to Forensic Investigations. Apress, ISBN-13: 978-1-4842-4459-3 3. William Stallings, “Cryptography and Network Security: Principles and Practice”. Pearson Publication.							
<b>Reference Books:</b> 1. William Stallings, Computer Security: Principles and Practices, Pearson, 6th Ed., ISBN: 978- 0- 13- 335469-0 2. Bernard Menezes, Network Security and Cryptography, Cengage Learning, ISBN-978-81- 315-1349- 1 3. Dr. V.K. Pachghare, Cryptography and Information security, PHI, Second edition, ISBN 978- 81- 203-5082-3							
<b>E-sources:</b> 1. <a href="https://www.udemy.com/course/certified-secure-netizen/">https://www.udemy.com/course/certified-secure-netizen/</a> 2. <a href="https://www.coursera.org/professional-certificates/google-cybersecurity">https://www.coursera.org/professional-certificates/google-cybersecurity</a>							

<b>Program :</b>	<b>B. Tech.(E&amp;TC)</b>			<b>Semester: III</b>			
<b>Course :</b>	<b>Industry 4.0</b> (OEC-Department Specific Course offered by Mechanical Department)			<b>Code</b>	<b>BME23OE04</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior knowledge of Basic programming skills, Mathematical skills is essential.</b>							
<b>Course Objectives:</b> This course aims at enabling students, 1. To introduce revolutions of manufacturing industry 2. To introduce technological advancement in modern manufacturing industries 3. To Introduce concepts of smart manufacturing, emphasizing Industry 4.0 in manufacturing industries							
<b>Course Outcomes:</b> After learning the course, the students should be able to: 1. Correlate the recent manufacturing trends and technological pillars of Industry 4.0. 2. Apply pillars of Industry 4.0 to the manufacturing industry. 3. Adapt the changes in existing manufacturing practices and relate the role of industrial robotics and sensors.							
<b>Detailed Syllabus:</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration [Hrs]</b>
1	<b>Industrial revolution and current state of industry:</b> Overview of industrial revolution, Introduction to Automation, hard automation, soft automation, classification of production system, adaptive control, overview of terminologies like CAD, CAM, CAE, CAPP etc.						<b>06</b>
2	<b>Introduction to Industry 4.0:</b> Introduction to industry 4.0, need for Industry 4.0, Framework for Industry 4.0, technological pillars in industrial 4.0, applications, challenges and scope for industry 4.0						<b>08</b>
3	<b>Technological developments in Industry 4.0:</b> Introduction to Smart Manufacturing, overview of big data and analytic techniques, cyber security, Internet of things (IoT), Industrial Internet of things (IIoT), Cloud computing, artificial intelligence.						<b>08</b>
4	<b>Robotics and Sensors:</b> Introduction to technological components of Robot, classification of sensors and its applications in Manufacturing industry, Role of robots in Industry 4.0, Internet of Robotic Things, Cloud Robotics, and Cognitive Architecture for Cyber-Physical Robotics						<b>08</b>
	<b>Total</b>						<b>30</b>
<b>Text Books:</b> 1. Nine pillars of technologies for Industry 4.0, W. Leong, IET publishers, 2020 2. Industry 4.0, A. Gilchrist, Apress Publication, 2016 3. Industrial Automation: Hands On, Lamb, Frank. , McGraw-Hill Professional, 2013							
<b>Reference Books:</b> 1. C. Schröder, The Challenges of Industry 4.0 for Small and Medium-sized Enterprises, 2021. 2. Chua C. K., Leong K. F., Lim C. S., Rapid Prototyping, World Scientific, 2012. 3. A. Nayyar and A. Kumar, A Roadmap to Industry 4.0: Smart Production, Sharp Business and Sustainable Development-Springer International Publishing, 2020. <a href="https://doi.org/10.1007/978-3-030-14544-6">https://doi.org/10.1007/978-3-030-14544-6</a> 4. K. Kumar, D. Zindani, J. P. Davim, Industry 4.0: Developments towards the Fourth Industrial Revolution, Springer Singapore, 2019.							
<b>E-sources:</b> 1. <a href="https://nptel.ac.in/courses/108105063">https://nptel.ac.in/courses/108105063</a>							

<b>Program :</b>	<b>B. Tech.(E&amp;TC)</b>			<b>Semester: III</b>			
<b>Course :</b>	<b>Energy Storage Management</b> (OEC-Department Specific Course offered by Mechanical Department)			<b>Code :</b>	<b>BME23OE05</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior knowledge of Fundamentals of Engineering and basic sciences is essential.</b>							
<b>Course Objectives:</b> This course aims at enabling students, 1. To explore energy storage systems' fundamentals, technologies, and applications. 2. To enable students to understand the principles of energy storage systems design. 3. To provide a general awareness of energy storage audit, safety, and management.							
<b>Course Outcomes:</b> After learning the course, the students should be able to: 1. Differentiate and select energy storage systems based on performance and safety. 2. Select material and analyze the energy storage in thermochemical form. 3. Analyze energy storage system with batteries/supercapacitors/fuel cells. 4. Perform audit of Energy storage systems							
<b>Detailed Syllabus:</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration [Hrs]</b>
1	<b>Energy storage system:</b> Introduction, Need, Modes, Energy storage devices, Merits, and Demerits of different types of Storage, utilization, and system applications. <b>Performance:</b> Energy capture rate and efficiency, Discharge rate and efficiency, Dispatch ability and load flowing characteristics, Scale flexibility, durability, Cycle lifetime, mass.						8
2	<b>Thermochemical storage</b> – Types, Phase Change Materials (PCMs) and classifications, properties of the PCMs for different temperature ranges, Selection criteria of PCMs for heating and cooling in buildings, Application of PCM in energy storage. SHS mediums, Energy analysis of the latent heat storage based on different systems						7
3	<b>Energy Storage for transportation:</b> Mechanical Design and Packaging of Battery, Packs for Electric Vehicles, Advanced Battery-Assisted Quick Charger for Electric Vehicles, Charging Optimization Methods for Li-ion Batteries, Thermal run-away for battery systems, State of Charge and Health Estimation Over the Battery Lifespan, Recycling of Batteries from Electric Vehicles <b>Fuel cell:</b> Operational principle, types, hybrid fuel cell-battery systems, hybrid fuel cell-supercapacitor systems,						8
4	<b>Energy Storage Management</b> Relationship between economic growth and energy use, Energy demand analysis in different economic sectors, increase energy conversion efficiencies by introducing energy storage, Energy audit of energy storage system, The carbon markets, Safety: Risks of fire, explosion, toxicity, Ease of materials, recycling, and recovery, Environmental consideration, and recycling						7
	<b>Total</b>						<b>30</b>
<b>Text Books:</b> 1. A. R. Pendse, “Energy Storage Science and Technology,” SBS Publishers & Distributors Pvt. Ltd., New Delhi, (ISBN – 13:9789380090122), 2011. 2. Jiujun Zhang, Lei Zhang, Hansan Liu, Andy Sun, Ru-Shi Liu, “Electrochemical Technologies for Energy Storage and Conversion,” John Wiley and Sons, 2012. 3. Lithium-Ion Batteries Basics and Applications by Reiner Korthauer, Springer. 4. Fuel cells from fundamentals to applications by Supramaniam Srinivasan, Springer.							
<b>Reference Books:</b> 1. Frank S. Barnes and Jonah G. Levine, Large Energy Storage Systems Handbook (Mechanical and Aerospace Engineering Series), CRC press (2011) 2. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt, “Energy Storage in Power Systems” Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016. 3. Pistoia, Gianfranco, and Boryann Liaw. The behavior of Lithium-Ion Batteries in Electric Vehicles: Battery Health, Performance, Safety, and Cost. Springer International Publishing AG, 2018. 4. E. Lipman, A. Z. Weber, Fuel Cells and Hydrogen Production, A Volume in the Encyclopedia of Sustainability Science and Technology, Second Edition, Springer reference. 5. Handbook of Energy Audit by Sonal Desai Publisher Tata McGraw Hill.							

<b>Program :</b>	<b>S. Y BTech (Open for All Branches offered by E&amp;Tc Department)</b>			<b>Semester: III</b>			
<b>Course :</b>	<b>Human Behavior, Ethics &amp; Wisdom</b>			<b>Code :</b>	<b>BET23OE04</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
<b>02</b>	<b>02</b>	<b>-</b>	<b>-</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior knowledge is not essential.</b>							
<b>Course Objectives:</b>							
This course aims at enabling students,							
1. To develop a clear understanding of success in terms of academic, career, and life dimensions, and help students identify the ultimate human goal.							
2. To enable students to build harmonious relationships and responsible behavior based on right understanding, values, and priorities.							
3. To cultivate ethical conduct and holistic thinking for sustainable living, professional competence, and universal harmony.							
<b>Course Outcomes:</b>							
After learning the course, the students will be able to:							
1. Differentiate the career success, academic success and life success.							
2. Identify the correct priority order in life and illustrate the human goal.							
3. Understand that the relationships are definite.							
4. Understand the Interconnectedness between all the orders in existence							
<b>Detailed Syllabus:</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration [Hrs]</b>
1	<b>Understanding success and Living domain of Human</b> Academic success (marks), career success (recognition & position), life success (balance & contentment), ultimate goal of human being, Difference between happiness and excitement Continuous happiness vs temporary pleasure, Right Understanding (RU), Relationship (R), Physical Facility (PF) with right priority, how our choices are affected by RU, R, PF. Understand the human being On the basis of needs and activities						07
2	<b>Human Behavior</b> Behavior driven by: Desire or Fear or Understanding Relationship as the foundation of life, Understanding the expectations in 7 relationships Mother-Father/Son-Daughter, Husband-Wife, Brother-Sister, Friend-Friend, Teacher-Student, Colleague-Coworker, Societal Nine core human values in relationships (trust, respect, affection, care, etc.), Justice and fairness Marriage as: A foundation for family stability, Purpose of Marriage, Common Problems in Marriage Justice in Family, Ability to build Stable, respectful relationships, Parenting & Values						08
3	<b>Wisdom &amp; Universal Harmony (Holistic Living)</b> Sustainable living, Human role in society Human Goal (Resolution, Prosperity, Fearlessness, Coexistence) Five dimensions to fulfill human goal - Education- Sanskar (Inculcation), Justice-Protection, Production-Work, Exchange-Storage, Health-Self regulation Universal order and interconnectedness - The four orders in nature - Interconnectedness and mutual fulfillment						08
4	<b>Ethics &amp; Human Conduct</b> Natural acceptance, Responsibility and duty, Fair roles and responsibilities, Gender equality in dignity Definite Human Conduct -Behavior Work, Participation in relationships Right wealth, Right marital relationship, Right work and behavior Values, Policies, Character Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies,						07
	<b>Total</b>						30

**Text Books :**

1. A. Nagaraj, Jeevan Vidya: Ek Parichaya. Amarkantak, India: Jeevan Vidya Prakashan, 1999.
2. A. Nagaraj, Manava Vyavahāra Darsana. Amarkantak, India: Jeevan Vidya Prakashan, 2003.
3. R. R. Gaur, R. Asthana, and G. P. Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd rev. ed. New Delhi, India: Excel Books, 2019. ISBN: 978-93-87034-47-1.

**Reference Books:**

1. A. Nagaraj, Vyavahārvādī Samājshāstra. Amarkantak, India: Jeevan Vidya Prakashan, 1999.
2. A. Nagaraj, Vyavharatmak Janvad. Amarkantak, India: Jeevan Vidya Prakashan, 2009.
3. A. Nagaraj, Abhyas Darshan. Amarkantak, India: Jeevan Vidya Prakashan, 2004.
4. M. K. Gandhi, Hind Swaraj or Indian Home Rule. Ahmedabad, India: Navajivan Publishing House, 1909.
5. S. R. Covey, The Seven Habits of Highly Effective People. New York, NY, USA: Free Press, 1989.
6. Aristotle, The Nicomachean Ethics. Translated by W. D. Ross. Oxford, U.K.: Oxford University Press, 1925.

**Links for additional learning**

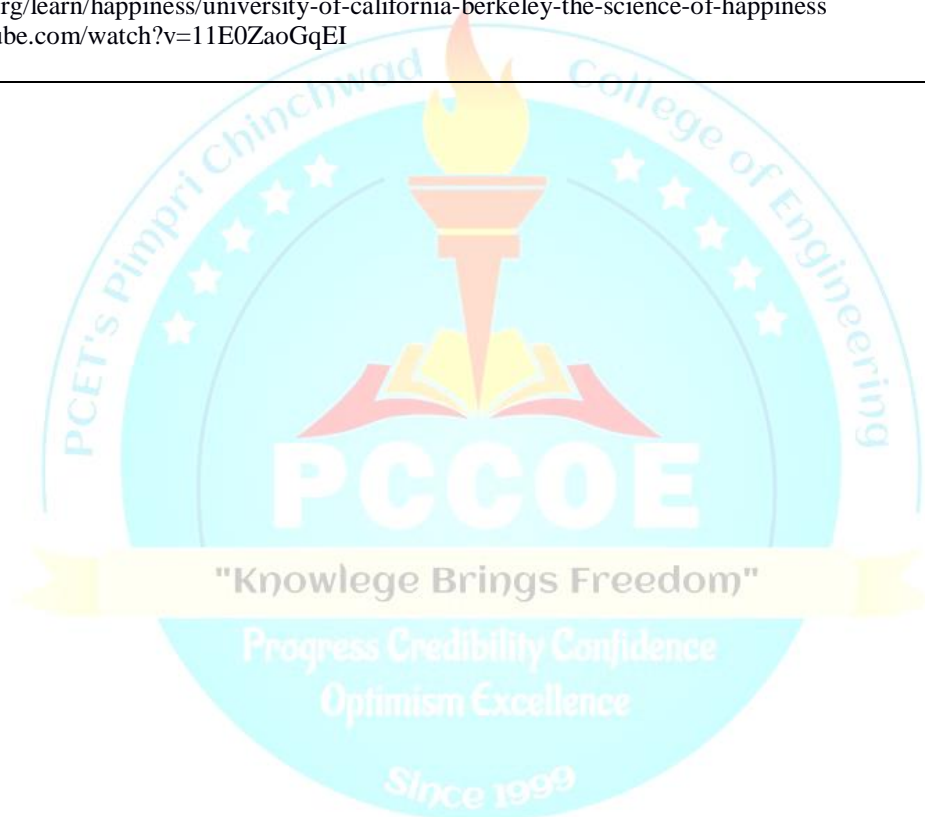
<http://madhyasth-darshan.info/postulations/knowledge/knowledge-of-humane-conduct/>

[https://www.youtube.com/channel/UCQxWr5QB\\_eZUnwxSwxXEkQw](https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw)

<https://youtu.be/OgdNx0X923I>

<https://www.edx.org/learn/happiness/university-of-california-berkeley-the-science-of-happiness>

<https://www.youtube.com/watch?v=11E0ZaoGqEI>



<b>Program :</b>	<b>B. Tech. (E&amp;TC)</b>			<b>Semester: III</b>			
<b>Course :</b>	<b>Industrial Management</b>			<b>Code :</b>	<b>BET23EM01</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
<b>02</b>	<b>02</b>	<b>-</b>	<b>-</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior knowledge of</b> Basic understanding of engineering operations along with elementary mathematics and economics <b>is essential.</b>							
<b>Course Objectives:</b> <ol style="list-style-type: none"> <li>To introduce principles of industrial management relevant to engineering industries.</li> <li>To understand production, materials, and quality management with AI-enabled decision support.</li> <li>To familiarize students with human resource and safety management using intelligent systems.</li> <li>To expose students to AI-driven modern industrial practices and Industry 4.0 concepts.</li> </ol>							
<b>Course Outcomes:</b> After learning the course, the students should be able to: <ol style="list-style-type: none"> <li>Explain industrial management principles and the role of AI in managerial functions.</li> <li>Apply production and materials management techniques using AI-based approaches.</li> <li>Understand AI-enabled HR, quality, and reliability management practices.</li> <li>Analyze financial, safety, sustainability, and ethical issues in AI-driven industries.</li> </ol>							
<b>Detailed Syllabus:</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration [Hrs]</b>
1	<b>Basics of Industrial Management &amp; AI Overview</b> Definition, scope, and importance of industrial management, Functions of management: planning, organizing, staffing, directing, controlling, Evolution of management thought, Organizational structures: line, functional, matrix, Introduction to Artificial Intelligence in Management, Definition of AI, Machine Learning, and Data Analytics, Role of AI in managerial decision-making, Applications of AI in electronics and telecommunication industries, Demand forecasting, Workflow optimization						07
2	<b>Production, PPC, Materials Management &amp; AI Tools:</b> Production management and PPC, Scheduling and resource allocation, Plant location and layout, Materials and inventory management, Inventory control techniques: EOQ, ABC, JIT, I Applications in Production & Materials Management, AI-based demand forecasting, Predictive inventory management, Smart warehousing using IoT and AI, Production scheduling using machine learning models, Case examples from electronics manufacturing and telecom equipment industries						08
3	<b>Human Resource, Quality Management &amp; AI</b> Human Resource Management, HR functions: recruitment, training, performance evaluation, Motivation and leadership theories, Industrial relations, AI in HR Management, AI-based recruitment and resume screening, Workforce performance analytics, Intelligent training systems, Quality Management, Quality concepts and assurance, TQM and quality control tools, Reliability in electronic systems, AI in Quality Management, Automated defect detection using AI, Predictive maintenance, AI-based fault diagnosis in communication systems						07
4	<b>Financial, Safety, Sustainability &amp; AI-Driven Industry</b> Financial management basics and break-even analysis, Cost control techniques, Industrial safety management, Environmental management and sustainability, AI-Enabled Modern Practices, Lean and Six Sigma with data analytics, AI-based safety monitoring systems, Industry 4.0 and Smart Factories, Digital twins (introductory concepts), Ethical implications of AI in industry						08
	<b>Total</b>						30
<b>Text Books:</b> <ol style="list-style-type: none"> <li>Partha Protim Borthakur, Industrial Engineering and Management: A Comprehensive Introduction, AkiNik Publications, 2023 (Indian Author).</li> <li>Sunil Erevelles &amp; Natarajan U. (Editors), Artificial Intelligence for Business and Industry, CRC Press, 2024.</li> </ol>							
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>Martand T. Telsang, Industrial Engineering and Production Management, S. Chand Publishing, Latest Reprint.</li> </ol>							

<b>Program:</b>	<b>S.Y.B. Tech. (E&amp;TC)</b>				<b>Semester:</b>	<b>III</b>		
<b>Course:</b>	<b>Universal Human Values</b>				<b>Code:</b>	<b>BSH23VE01</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
2	2	-	-	-	25	25	-	50

**Prior knowledge is not essential.**

**Course Objectives:**

This course aims at enabling students,

1. To appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
2. To facilitate the development of a holistic perspective among students to lead their personal and professional lives in an ethical way.
3. To highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour, and mutually enriching interaction with nature.

**Course Outcomes:**

After learning the course, the students should be able to:

1. **Illustrate** the relevance of Universal Human Values using real-life examples from personal, social, and professional contexts.
2. **Interpret** a human being as the co-existence of 'Self' and 'Body'.
3. **Apply** the concept of harmony in family and society to given scenarios with appropriate value-based actions.
4. **Apply** Universal Human Values to promote coexistence with nature in personal and professional life.

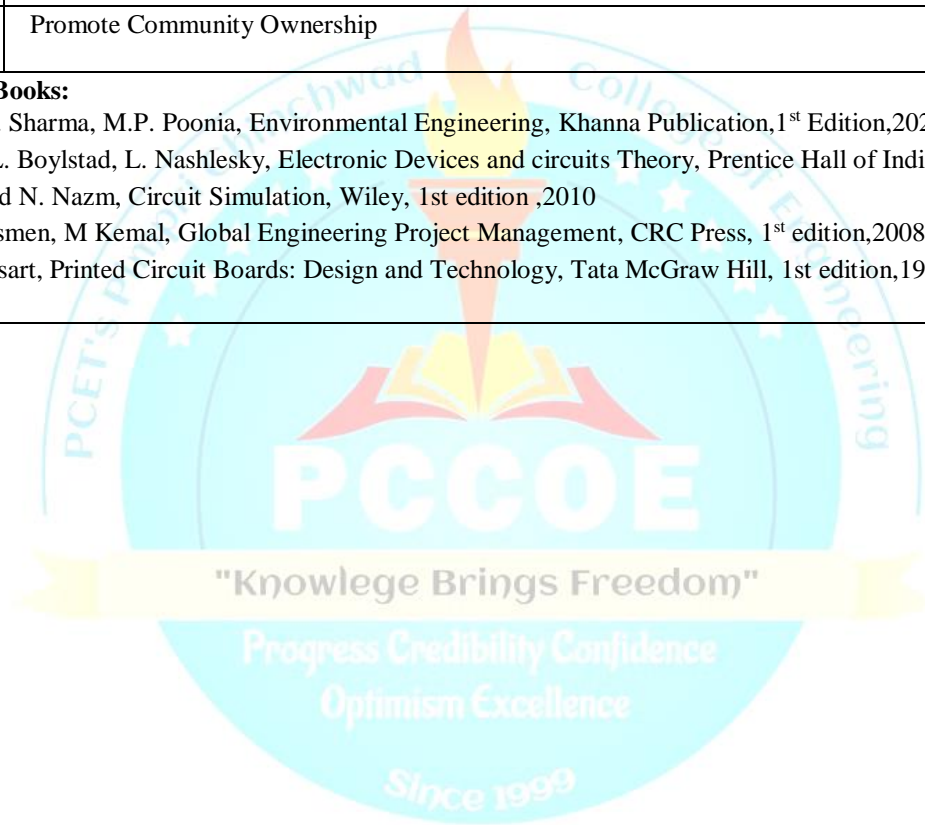
**Detailed Syllabus**

<b>Unit</b>	<b>Description</b>	<b>Duration [Hrs]</b>
1	<b>Introduction to Value Education:</b> <ul style="list-style-type: none"> <li>• Understanding Value Education</li> <li>• Self-exploration as the Process for Value Education</li> <li>• Continuous Happiness and Prosperity</li> <li>• Right Understanding</li> <li>• Current Scenario</li> <li>• Method to fulfil the Basic Human Aspirations</li> </ul>	4
	<b>Sharing Session:</b> <ul style="list-style-type: none"> <li>• Sharing about Oneself</li> <li>• Exploring Human Consciousness</li> <li>• Exploring Natural Acceptance</li> </ul>	3
2	<b>Harmony in the Human Being:</b> <ul style="list-style-type: none"> <li>• Human being: the Co-existence of the Self and the Body</li> <li>• Needs of the Self and the Body</li> <li>• The Body as an Instrument of the Self</li> <li>• Understanding Harmony in the Self</li> <li>• Harmony of the Self with the Body</li> <li>• Programme to Ensure Self-Regulation and Health</li> </ul>	4
	<b>Sharing Session:</b> <ul style="list-style-type: none"> <li>• Exploring the Difference between Needs of Self and Body</li> <li>• Exploring Sources of Imagination in the Self</li> <li>• Exploring Harmony of Self with the Body</li> <li>• AI Integration: Personal Habit Analysis</li> </ul>	4
3	<b>Harmony in the Family and in Society:</b> <ul style="list-style-type: none"> <li>• Harmony in the Family</li> <li>• 'Trust'—the Foundational Value in Relationship</li> <li>• 'Respect'—the Right Evaluation</li> <li>• Other feelings (Values) in Human-to-Human Relationship</li> <li>• Understanding Harmony in Society</li> <li>• Vision for the Universal Human Order</li> <li>• Five Dimensions of Human Order</li> </ul>	4

	<b>Sharing Session:</b> <ul style="list-style-type: none"> <li>• Exploring the Feeling of Trust</li> <li>• Exploring the Feeling of Respect and Exploring Systems to</li> <li>• Fulfil Human Goal</li> </ul>	3
4	<b>Harmony in Nature/Existence:</b> <ul style="list-style-type: none"> <li>• Understanding Harmony in Nature,</li> <li>• Realizing Existence as Coexistence at All Levels</li> <li>• The Holistic Perception of Harmony in Existence</li> </ul> <b>Implications of Holistic Understanding: A Look at Professional Ethics:</b> <ul style="list-style-type: none"> <li>• Definitiveness of (Ethical) Human Conduct</li> <li>• Humanistic Constitution and Universal Human Order</li> <li>• Competence in Professional Ethics</li> <li>• Holistic Technologies, Production Systems and Management Models -Typical Case Studies</li> </ul> Strategies for Transitioning towards Value-Based Life and Profession.	4
	<b>Sharing Session:</b> <ul style="list-style-type: none"> <li>• Exploring the Four Orders of Nature</li> <li>• Exploring Co-existence in Existence</li> <li>• Exploring AI for Holistic Technologies</li> <li>• Exploring Humanistic Models in Education</li> </ul> Exploring Steps of Transition towards Universal Human Order	4
<b>Total</b>		<b>30</b>
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. R R Gaur, R Sangal, G P Bagaria, 2019, A Foundation Course in HUMAN VALUES and Professional Ethics- Presenting a universal approach to value education through self-exploration, Excel Books</li> </ol>		
<b>Reference Books:</b> P.L. Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers. <ol style="list-style-type: none"> <li>1. A. Nagaraj, 1999, JeevanVidya: EkParichaya, JeevanVidyaPrakashan, Amarkantak,</li> <li>2. A. N. Tripathy, 2003, Human Values, New Age International Publishers.</li> <li>3. E. G. Seebauer &amp; Robert L. Berry, 2000, Fundamentals of Ethics for Scientists &amp; Engineers , Oxford University Press</li> <li>4. M. Govindrajran, S Natrajan &amp; V.S. Senthil Kumar, Engineering Ethics and Human Values, Eastern Economy Edition, Prentice Hall of India Ltd.</li> <li>5. B. P. Banerjee, 2005, Foundations of Ethics and Management, Excel Books.</li> <li>6. B. L. Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.</li> </ol>		
<b>e-sources:</b> <ol style="list-style-type: none"> <li>1. <a href="http://madhyasth-darshan.info/postulations/knowledge/knowledge-of-humane-conduct/">http://madhyasth-darshan.info/postulations/knowledge/knowledge-of-humane-conduct/</a></li> <li>2. <a href="https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw">https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw</a></li> <li>3. <a href="https://youtu.be/OgdNx0X923I">https://youtu.be/OgdNx0X923I</a></li> </ol>		

<b>Program:</b>	<b>B. Tech. (E&amp;TC)</b>					<b>Semester: III</b>	
<b>Course:</b>	<b>Community Engagement Project</b>					<b>Code:</b>	<b>BET23EL01</b>
<b>Credits</b>	<b>Teaching Scheme (Hrs. /Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Theory</b>	<b>Practical</b>	<b>Tutorial</b>	<b>TW</b>	<b>OR</b>	<b>PR</b>	<b>Total</b>
2	-	4	-	100	-	-	100
<b>Prior knowledge of</b> General awareness of societal problems <b>is essential.</b>							
<b>Course Objectives:</b> <ol style="list-style-type: none"> <li>1. Develop the ability to identify and define community challenges and needs that can be addressed through engineering solutions.</li> <li>2. Acquire skills in project planning, including defining project scopes, setting goals, developing timelines, and managing resources effectively.</li> <li>3. Develop and enhance technical skills relevant to the environmental engineering discipline involved in the community project.</li> <li>4. Identify potential risks associated with the community project and develop strategies for risk assessment.</li> </ol>							
<b>Course Outcomes:</b> After completing the course, the students should be able to: <ol style="list-style-type: none"> <li>1. Identify and comprehend the specific needs and challenges within a community that can be addressed through engineering solutions.</li> <li>2. Incorporate sustainable engineering practices into project designs, considering environmental, social, and economic impacts.</li> </ol>							
<b>Guidelines:</b> <ol style="list-style-type: none"> <li>1. Projects to be carried in CEP has to be compulsory based on Environmental Domain.</li> <li>2. Per batch minimum 2 projects to be assigned. (24 projects )</li> <li>3. Domains in Environmental studies are as follows, anyone can be selected.</li> </ol> <p>Community engineering projects that combine electronics and telecommunication engineering with environmental engineering can address critical challenges related to environmental monitoring, conservation, and sustainability. Wwithin the environmental engineering domain for Electronics and Telecommunication Engineering following Areas can be considered.(cannot be limited to):</p> <ol style="list-style-type: none"> <li>1. Air Quality Monitoring System</li> <li>2. Smart Waste Management</li> <li>3. Water Quality Monitoring and Management</li> <li>4. Smart Irrigation System</li> <li>5. Forest Fire Detection and Prevention</li> <li>6. Noise Pollution Monitoring</li> <li>7. Green Building Monitoring</li> <li>8. Urban Heat Island Mitigation</li> <li>9. Biodiversity Monitoring and Conservation</li> <li>10. Community Solar Power Grid</li> <li>11. River and Flood Monitoring System</li> <li>12. Smart Green Transportation</li> <li>13. Environmental Education Platform</li> <li>14. Community Garden Automation</li> <li>15. Sustainable Community Development Dashboard</li> <li>16. Sewage engineering</li> <li>17. Public health engineering</li> <li>18. Wastewater engineering</li> <li>19. Sanitary engineering</li> <li>20. Non-conventional energy engineering.</li> <li>21. Smart cities.</li> </ol>							
<b>Team Formation:</b> <ol style="list-style-type: none"> <li>1. In One batch there will be <b>two groups of 9-10</b> students who will function as a team to complete the CEP based on above said topics.</li> <li>2. <b>Group of ten</b> will have following team members functioning as a project team <ol style="list-style-type: none"> <li>a. Team Lead</li> <li>b. Technology head + Members</li> <li>c. Field deployment Head + Members</li> <li>d. Cost and Recourse manager</li> </ol> </li> </ol>							

Digital Media Manager +Members (Synopsis, Report, Video, Flyer, Poster)	
<b>Expt. No.</b>	<b>Suggested List of Experiments</b>
<b>1</b>	Identify Community (environmental) Needs, Define Project Objectives, Formulate a Project Team
<b>2</b>	Research and Technology Selection, Integration of Electronics and Telecommunication for Solution of Problem
<b>3</b>	Develop User Interfaces, Network and Communication Setup in community
<b>4</b>	Pilot Testing of solution, Scale Up and Deployment
<b>5</b>	Community Engagement activities, Monitoring and Maintenance
<b>6</b>	Data Analysis and Reporting, Community Impact Assessment
<b>7</b>	Documentation and Knowledge Transfer
<b>8</b>	Promote Community Ownership
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. S.C. Sharma, M.P. Poonia, Environmental Engineering, Khanna Publication, 1<sup>st</sup> Edition, 2020</li> <li>2. R. L. Boylstad, L. Nashlesky, Electronic Devices and circuits Theory, Prentice Hall of India, 11th edition, 2013</li> <li>3. Farid N. Nazm, Circuit Simulation, Wiley, 1st edition, 2010</li> <li>4. Atesmen, M Kemal, Global Engineering Project Management, CRC Press, 1<sup>st</sup> edition, 2008</li> <li>5. Bossart, Printed Circuit Boards: Design and Technology, Tata McGraw Hill, 1st edition, 1983.</li> </ol>	



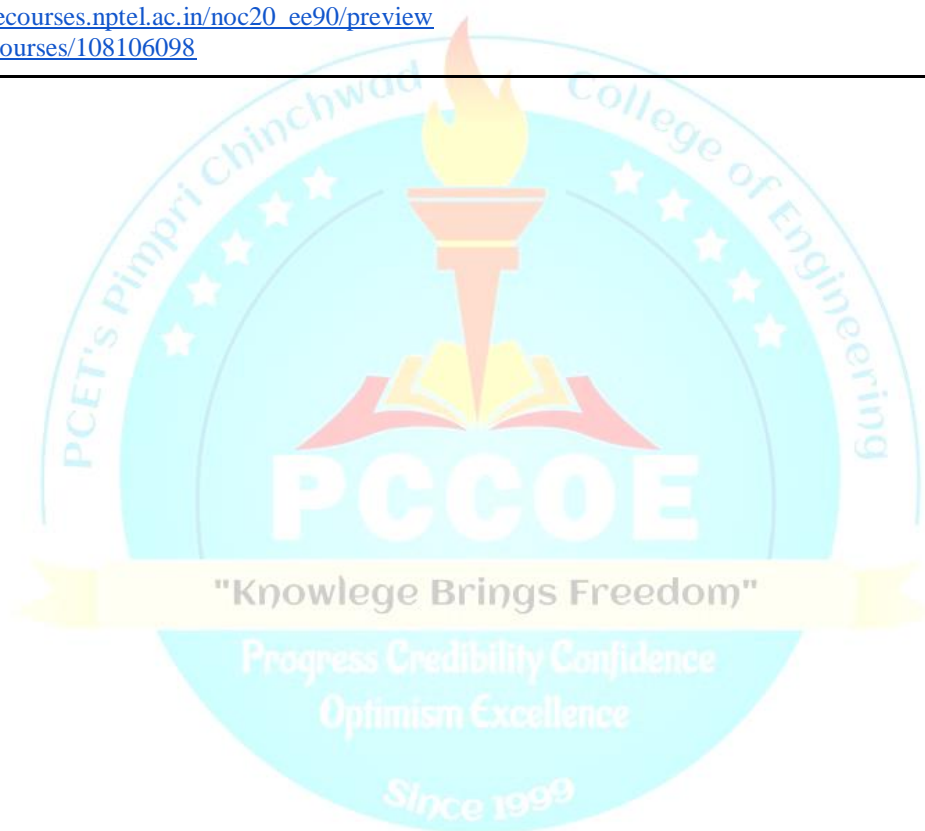
**Course Syllabus**  
**Second Year B. Tech.**  
**Sem-IV**

Progress Credibility Confidence  
Optimism Excellence

*Since 1999*

<b>Program: B. Tech. (E&amp;TC)</b>					<b>Semester : IV</b>			
<b>Course : Control Systems</b>					<b>Code : BET24PC01</b>			
Credits	Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	Other	FA		TW	Total
					FA1	FA2		
<b>02</b>	<b>-</b>	<b>4</b>	<b>-</b>	<b>1</b>	<b>25</b>	<b>25</b>	<b>50</b>	<b>100</b>
<b>Prior knowledge of Laplace Transforms, Differential Equation, Signals and Systems is essential</b>								
<b>Course Objectives:</b> This course aims at enabling students, <ol style="list-style-type: none"> <li>To provide a basic understanding of the concepts and techniques involved in designing control systems.</li> <li>To explain time domain and frequency domain analysis of control system</li> <li>To describe different types of controllers and analyze their performance</li> </ol>								
<b>Course Outcomes:</b> After learning the course, the students should be able to: <ol style="list-style-type: none"> <li>Determine the transfer function of closed loop control system and locate poles and zeros for a given transfer function.</li> <li>Evaluate the various parameters of time domain analysis of a control system.</li> <li>Examine the stability criteria for a control system using Bode and Nyquist plot.</li> <li>Analyze the performance of K<sub>p</sub>, K<sub>d</sub> and K<sub>i</sub> of PID controller on system Parameters</li> </ol>								
<b>General Guidelines: Any Eight Experiments is to be performed using suitable tools to meet the above outcomes.</b>								
Detailed Syllabus: Introduction to Control, Classification of Control Systems, Closed Loop Control System with Feedback, Standard Inputs, Transfer Function, Poles and Zeros, Response to various Inputs, Effect of Poles, Effect of Zeros, Closed Loop Transfer Function, First Order Systems. Second Order Systems, Unit Step Response of Underdamped Second Order Systems, Concepts of Rise Time, Peak Time, Maximum Peak Overshoot and Settling Time, Routh's Stability Criterion, Use in Control Design, Incorporation of Performance Specifications in Controller, Design, Analysis of Steady State Errors, Root Locus and its Application in Control Design, Frequency Response, Bode Plots, Nyquist Plots, Nyquist Stability Criterion, Relative Stability – Gain and Phase Margins, Controllers – Proportional (P), Integral (I) and Derivative (D) Blocks, Examples of PID controller design, Control System Design via Frequency Response – Lead, Lag and Lag-Lead Compensation, Case Studies.								
Exp. No.	List of Experiments							
1	Explore different toolboxes in MATLAB, Introduction to Control Systems Toolbox.							
2	Determine the transfer function for given closed loop system in block diagram representation.							
3	Plot the pole-zero configuration in s-plane for the given transfer function.							
4	Plot unit step response of given transfer function and finds delay time, rise time, peak time and peak overshoot.							
5	Determine the time response of given system subjected to any arbitrary input.							
6	Plot root locus of given transfer function, locate closed loop poles for different values of k.							
7	Determine the steady state errors of a given transfer function.							
8	Plot bode plot of given transfer function. Also determine the relative stability by measuring gain and phase margins							
9	Plot Nyquist plot for given transfer function and to discuss closed loop stability. Also determine the relative stability by measuring gain and phase margin.							

10	Effect of variation of $K_p$ , $K_d$ and $K_i$ of PID controller on system Parameters
11	Mini Projects/Case Study Implementations
Self-learning: Choice of contents lies with course faculty with prior approval in course coordinator meeting.	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. M. Gopal — Control System - Principles and Design, Tata McGraw Hill, 4th Edition, 2012.</li> <li>2. Katsuhiko Ogata — Modern Control Engineering, 5/e, Pearson Education 2015</li> <li>3. A. Nagoor Kanni — Control Systems, McGraw Hill, 2nd Edition, 2017</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Dr. Farid Golnaraghi, Benjamin C. Kuo — Automatic Control Systems, McGraw Hill, 10th Edition, 2017</li> <li>2. S. K. Bhattacharya — Control Systems Theory and Applications, Pearson, 3<sup>rd</sup> edition, 2013</li> </ol> <p><b>Online Courses:</b></p> <p><a href="https://onlinecourses.nptel.ac.in/noc20_ee90/preview">https://onlinecourses.nptel.ac.in/noc20_ee90/preview</a>  <a href="https://nptel.ac.in/courses/108106098">https://nptel.ac.in/courses/108106098</a></p>	



<b>Program :</b>	<b>B. Tech. (E&amp;TC)</b>				<b>Semester: IV</b>			
<b>Course :</b>	<b>Microcontrollers</b>				<b>Code : BET24PC02</b>			
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
<b>01</b>	<b>01</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior knowledge of</b>								
1. Basic Electronics Digital Electronics <b>is essential.</b>								
<b>Course Objectives:</b>								
This course aims at enabling students,								
1. To understand the fundamental principles of microcontrollers and their applications.								
2. To gain proficiency in programming and interfacing with the 8051 microcontroller.								
3. To develop skills in peripheral interfacing and serial communication techniques.								
4. To master the concepts of interrupts and their implementation in microcontroller systems.								
<b>Course Outcomes:</b>								
After learning the course, the students should be able to:								
1. Demonstrate a comprehensive understanding of embedded systems and microcontrollers, including the architecture, organization, and instruction set of the 8051 microcontroller.								
2. Learn to interface a range of real-world input-output peripheral devices with the 8051 microcontroller.								
<b>Detailed Syllabus:</b>								
<b>Unit</b>	<b>Description</b>							<b>Duration [Hrs]</b>
1	<b>Introduction to Microcontrollers:</b> Introduction to embedded systems and microcontrollers, Evolution and overview of the 8051 microcontroller, Architecture of the 8051 microcontroller: CPU, RAM, ROM, I/O ports, and timers, Instruction set architecture (ISA) of the 8051, Memory organization: Data memory and program memory, Assembly language programming for the 8051.							07
2	<b>Peripheral Interfacing, Serial Communication, and Interrupts</b> Overview of I/O interfacing techniques, Interfacing LEDs and switches with 8051, Interfacing 7-segment displays and multiplexed displays, Interfacing LCD displays, Timer programming, Interfacing external memory and ADC with 8051, Interfacing UART with 8051 for serial communication, Introduction to interrupts and their types, Interrupt handling in 8051.							08
	<b>Total</b>							15
Self-learning: Choice of contents lies with course faculty with prior approval in course coordinator meeting.								
<b>Text Books:</b>								
1. Mazidi, Muhammad Ali, Janice Gillispie Mazidi, and Rolin D. McKinlay. "The 8051 Microcontroller and Embedded Systems." Pearson Education, 2nd Edition, 2008, Upper Saddle River, NJ.								
2. Ayala, Kenneth J. "The 8051 Microcontroller." Cengage Learning, 3rd Edition, 2004, Delmar.								
<b>Reference Books:</b>								
1. Rafiqzaman, M. "Microcontroller Theory and Applications with the 8051 Family." Wiley India, 1st Edition, 2013, New Delhi.								
2. Mazidi, Muhammad Ali, Janice Gillispie Mazidi, and Rolin D. McKinlay. "The 8051 Microcontroller and Embedded Systems Using Assembly and C." Pearson Education, 2nd Edition, 2009, Upper Saddle River, NJ.								
3. Valvano, Jonathan W. "Embedded Systems: Real-Time Interfacing to Arm Cortex-M Microcontrollers." CreateSpace Independent Publishing Platform, 5th Edition, 2018.								

**e-sources:**

3. NPTEL Course on “Microcontrollers and Applications”, IIT Kanpur by Dr. S.P. Das  
<https://nptel.ac.in/courses/117104072>

4. NPTEL Course on “Microprocessors And Microcontrollers” by Prof. Shantanu Chattopadhyay  
<https://archive.nptel.ac.in/courses/108/105/108105102/>

"8051 Microcontroller - Embedded C and Assembly Language" on UdeMy: <https://www.udemy.com/course/8051-microcontroller-embedded-c-and-assembly-language/learn/>



Program: B. Tech. (E&TC)					Semester : IV			
Course : Microcontrollers Lab					Code : BET24PC03			
Credit	Teaching Scheme (Hrs./Week)				Evaluation Scheme			
	Lecture	Practical	Tutorial	Other	TW	OR	PR	Total
2	–	4	–	1	50	–	50	100
<b>Prior knowledge of:</b> Basic Electronics and Digital Electronics are essential.								
<b>Course Objectives:</b> <ol style="list-style-type: none"> <li>To make students aware of the architecture and programming of microcontrollers.</li> <li>To teach various hardware and software tools for developing applications.</li> </ol>								
<b>Course Outcomes:</b> After completing the course, the students should be able to: <ol style="list-style-type: none"> <li>Understand the fundamentals of programming of microcontrollers.</li> <li>Demonstrate the use of software and hardware tools for microcontroller-based development.</li> <li>Interface microcontroller with real-world peripheral devices.</li> </ol>								
<b>General Guidelines: All experiments are to be performed to meet the above outcomes.</b>								
<b>Detailed Syllabus</b>								
Exp. No.	List of Experiments							
1	Simple assembly programs for 8051: Arithmetic operations							
2	Simple assembly program for 8051: Find the smallest and largest numbers from a given array							
3	Write an assembly program for 8051 to arrange blocks of ten numbers in ascending and descending order							
4	Write an assembly program for 8051: Transfer data from internal memory to external memory, Convert decimal numbers to hexadecimal							
5	Write an embedded C program for Parallel port interfacing of LEDs							
6	Write an embedded C program to make an LED connected to the 8051 microcontroller blink at a specific rate using a timer							
7	Write an embedded C program to generate a square wave using a timer with an interrupt							
8	Write an embedded C program for serial communication between 8051 and the computer							
9	Write an embedded C program for ADC chip and 8051 Microcontroller data acquisition system							
10	Write an embedded C program for triangular waveform generation using DAC interfacing to 8051							
	Write an embedded C program for 16x2 LCD interfacing with 8051 (8-bit mode)							
11	Write an embedded C program for interfacing the Stepper motor to 8051							
12	Write an embedded C program for interfacing of DC motor/servo motor to 8051							
13	Interface a switch with the 8051 microcontroller and write an embedded C program to detect and respond to the switch press							

14	Interface external memory (EEPROM) with the 8051 microcontroller and write an embedded C program to read from and write to the memory
15	Practical Case Study and Project Implementation

Self-learning: Choice of contents lies with course faculty with prior approval in course coordinator meeting.

**Reference Books:**

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 8051 Microcontroller and Embedded Systems: Using Assembly and C, Pearson, 2nd Edition, 2007.
2. Pal Ajit, Microcontrollers: Principles and Applications, EEE, PHI, New Delhi 1st edition, 2012.
3. Predko Michael, Programming and customizing the 8051 microcontroller, McGraw-Hill, 1st edition, 2013.
4. Datasheet and manuals of 8051, etc.  
<https://www.datasheetarchive.com/>  
<https://www.keil.com/dd/docs/datashts/sst/s71255.pdf>



<b>Program :</b>	<b>B. Tech. (E&amp;TC)</b>				<b>Semester:IV</b>			
<b>Course :</b>	<b>Analog Integrated Circuits</b>				<b>Code : BET24PC04</b>			
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
<b>02</b>	<b>02</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>

**Prior knowledge of**  
a. Electronic Devices & Circuits  
b. Network Analysis **is essential.**

**Course Objectives:**

This course aims at enabling students,

1. To explain characteristics of Op-Amp.
2. To make students aware of analysis and design of various linear and nonlinear applications of Op-Amp.
3. To make the students familiar with Converters, PLL and its applications.
4. To educate students on types of power supply, performance parameters of power supply and design of power supply.

**Course Outcomes:**

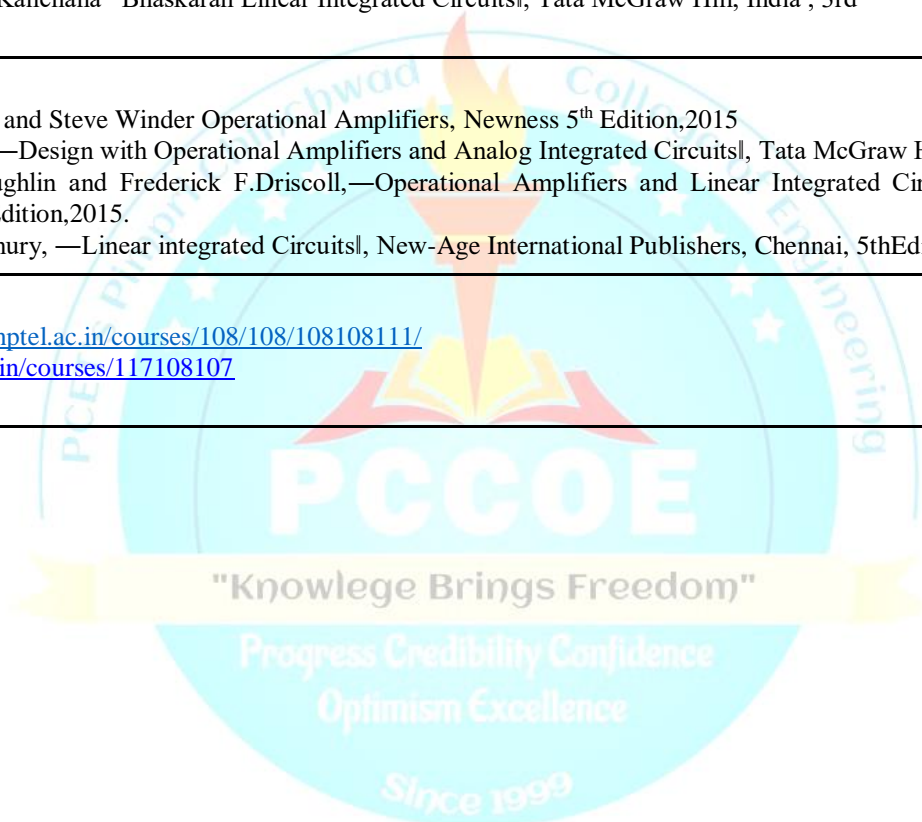
After learning the course, the students should be able to:

1. Comprehend the ideal and practical characteristics of op-amps.
2. Design linear and non-linear applications of Op-Amp.
3. Illustrate working of data converters using op-amp.
4. Design power supply of mentioned specifications.

**Detailed Syllabus:**

<b>Unit</b>	<b>Description</b>	<b>Duration [Hrs]</b>
1	<b>Introduction to OP-AMP and its Parameters:</b> Block diagram of typical op-amp, Differential Amplifier configurations, DC and AC Analysis of Differential amplifier for dual-input balanced-output configuration, Current sources, Current mirror. level shifters, Output stage. Various DC and AC parameters of op-amp, Ideal vs practical op-amp	08
2	<b>Linear and Non Linear Applications of OP-AMP</b> Concept of Virtual ground and virtual short, Inverting and Non- inverting amplifier, Summing amplifier, Averaging circuit, Difference amplifier, Voltage follower, practical Integrator, practical Differentiator, Instrumentation amplifier, Comparators, Limitations of op-amp as comparator, Schmitt Trigger, Precision full wave rectifiers, Square and Triangular wave generators, Wein bridge Oscillator	08
3	<b>Converters using OP-AMP , Timers and PLL</b> V to F converter, I to V converter and V to I converter, DAC: types, characteristics, specifications, advantages and disadvantages. ADC: types, characteristics, specifications, advantages and disadvantages. Comparison of different configurations of ADC and DAC. <b>Timers and PLL:</b> Timer: IC555 functional block diagram, Astable and Monostable mode of operation. Phase Locked Loop (PLL): Block diagram, types, characteristics and different applications. Voltage controlled oscillators.	07

4	<b>Voltage Regulators</b> Block diagram and performance parameters of DC Regulated power supply. Linear Regulator: series regulator, shunt regulator Protection circuits, fixed voltage regulator IC (78XX and 79XX series), variable voltage regulator IC (LM317 and LM337) Switching Regulators: Block diagram, types, Comparison with Linear Regulator	07
	<b>Total</b>	30
Self-learning: Choice of contents lies with course faculty with prior approval in course coordinator meeting.		
<b>Text Books:</b> 1. Ramakant A.Gayakwad Op Amps and Linear Integrated Circuits, Prentice Hall of India Pvt Ltd.,4th edition,2014. 2. Salivahanan and Kanchana Bhaskaran Linear Integrated Circuits, Tata McGraw Hill, India , 3rd Edition, 2018		
<b>Reference Books:</b> 1. George Clayton and Steve Winder Operational Amplifiers, Newness 5 <sup>th</sup> Edition,2015 2. Sergio Franco, —Design with Operational Amplifiers and Analog Integrated Circuits, Tata McGraw Hill,2012. 3. Robert F. Coughlin and Frederick F.Driscoll,—Operational Amplifiers and Linear Integrated Circuits, Pearson Education, Bangalore 6th Edition,2015. 4. J D.Roy Choudhury, —Linear integrated Circuits, New-Age International Publishers, Chennai, 5thEdition2017		
<b>e-sources:</b> 1. <a href="https://archive.nptel.ac.in/courses/108/108/108108111/">https://archive.nptel.ac.in/courses/108/108/108108111/</a> 2. <a href="https://nptel.ac.in/courses/117108107">https://nptel.ac.in/courses/117108107</a>		



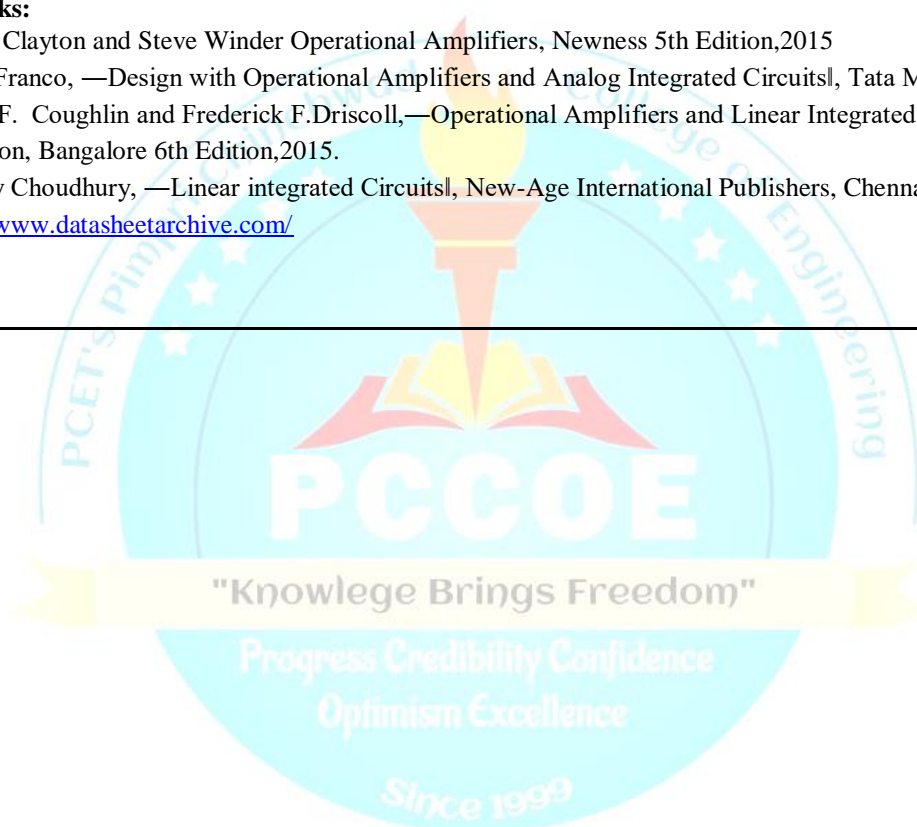
<b>Program: B. Tech. (E&amp;TC)</b>					<b>Semester : IV</b>			
<b>Course : Analog Integrated Circuits Lab</b>					<b>Code : BET24PC05</b>			
<b>Credit</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>TW</b>	<b>OR</b>	<b>PR</b>	<b>Total</b>
<b>1</b>	<b>–</b>	<b>2</b>	<b>–</b>	<b>1</b>	<b>25</b>	<b>–</b>	<b>25</b>	<b>50</b>
<b>Prior knowledge of:</b> a. Electronic Devices & Circuits b. Network Analysis is essential								
<b>Course Objectives:</b> Course Objectives: 1. To demonstrate parametric characterization of Op-Amp. 2. To make students to design various linear and nonlinear applications of Op-Amp. 3. To Simulate basic applications of op amp								
<b>Outcomes:</b> After completion of this course, students will be able to, 1. Experiment with op-amp for parametric characterization. 2. Design linear and nonlinear applications of Op-Amp. 3. Design power supply for given specifications.								
<b>Guidelines: First 4 experiment are compulsory and any two Experiments from 5 to 8 is to be performed to meet the above outcomes</b> <b>Practical:</b> 1. Practical for 25 Marks. 2. Practical Assessment will be based on PART A <b>Term work:</b> 1. Term Work for 25 Marks 2. For Term Work assessment only Mini Project is mandatory								
<b>Detailed Syllabus</b>								
<b>PART:A</b>								
<b>Exp. No.</b>	<b>List of Experiments</b>							
1	Measure and verify op-amp parameters and compare with the specifications							
2	Design, build and test practical integrator for given cut off frequency							
3	Design, build and test Schmitt trigger and plot transfer characteristics							
4	Design , build and test a regulated DC power supply using three pin voltage regulator IC.							
5	Simulate 2-bit R-2R Ladder DAC							
6	Design, build and test square & triangular wave generator.							
7	Design, built and test astable multivibrator using IC555							
8	Simulate precision half & full wave rectifier							
<b>PART B : Mini Project</b>								

1	Formation of Group, Finalization of Topic
2	Submission of Synopsis
3	Completion of Simulation
4	Completion of Hardware
5	Completion of Hardware

Self-learning: Choice of contents lies with course faculty with prior approval in course coordinator meeting.

**Reference Books:**

1. George Clayton and Steve Winder Operational Amplifiers, Newness 5th Edition,2015
2. Sergio Franco, —Design with Operational Amplifiers and Analog Integrated Circuitsl, Tata McGraw Hill,2012.
3. Robert F. Coughlin and Frederick F.Driscoll,—Operational Amplifiers and Linear Integrated Circuitsl, Pearson Education, Bangalore 6th Edition,2015.
4. J D.Roy Choudhury, —Linear integrated Circuitsl, New-Age International Publishers, Chennai, 5thEdition2017
5. <https://www.datasheetarchive.com/>





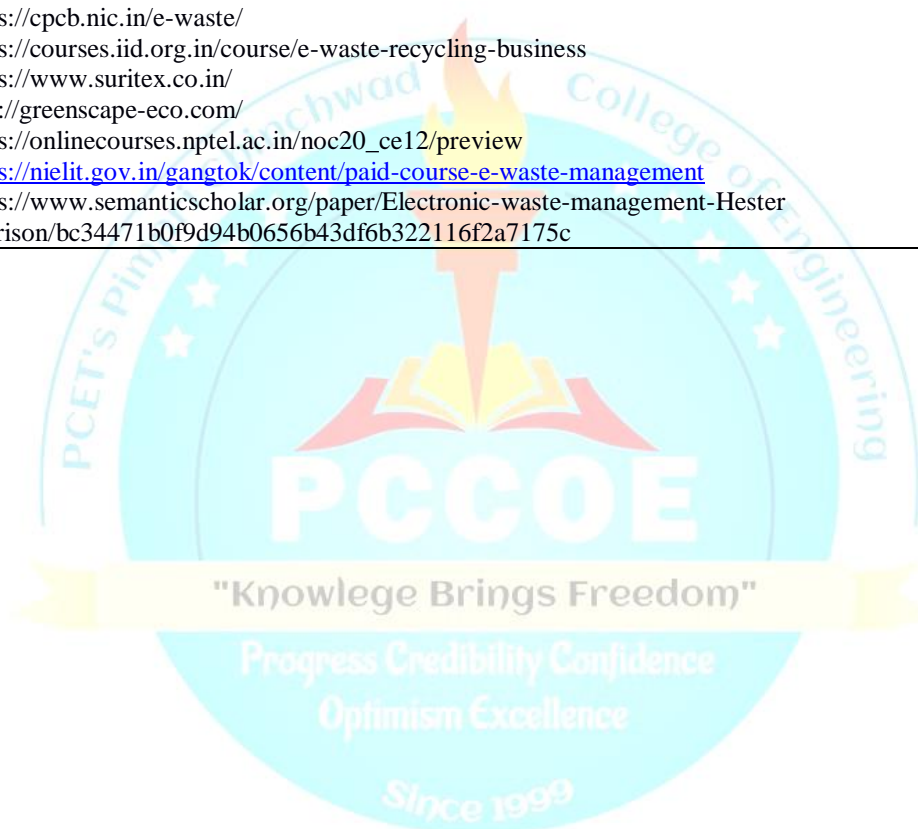
# **OEC-Engineering Sciences Syllabus**

<b>Program:</b>	S.Y. B. Tech. (E&TC)				<b>Semester: IV</b>			
<b>Course:</b>	Statistical Data Analysis Using R (OE – Engineering Sciences) (Offered by AS&H)				<b>Code:</b>	BSH24OE04		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
2	2	-	-	-	10	10	30	50
<b>Prior knowledge of:</b> Basics of Statistics and Probability are essential.								
<b>Course Objectives:</b> After completion of the course, students will have an adequate background, conceptual clarity, and knowledge of mathematical principles related to data, preprocessing techniques for data visualization, and statistical techniques for prediction and decision-making.								
<b>Course Outcomes:</b> After learning the course, the students should be able to: <ol style="list-style-type: none"> <li>1. Apply R software and data handling techniques for the given data</li> <li>2. Apply data pre-processing techniques to clean and transform datasets.</li> <li>3. Draw inferences from data using appropriate visualization techniques.</li> <li>4. Analyse the data for decision-making using statistical methods.</li> </ol>								
<b>Detailed Syllabus</b>								
<b>Unit</b>	<b>Description</b>							<b>Duration [Hrs]</b>
1	<b>Fundamentals of R Software for Data</b> Introduction to Data: Definition, Types and Properties, R Packages for Data Science, Importing and Exporting Data in R Software, Accessing Databases with R Software.							7
2	<b>Data Wrangling</b> Pre-processing Data in R Software, Dealing with Missing Values, Data Formatting in R Software, Data Normalization in R Software, Binning in R Software, and Conversion of data types							7
3	<b>Data Visualization</b> Data visualisation for various data categories like Categorical, Numerical, or both using plots like Histogram, Bar/ Line Chart, Box Plots (including group-by option), Scatter Plots, Mosaic Plot, etc., and their interpretations							8
4	<b>Data Analysis</b> Sampling, Descriptive Statistics, Linear regression and Multiple linear regression. Model evaluation using visualization, prediction, and decision-making.							8
<b>Total</b>							<b>30</b>	
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. Montgomery and Runger, “Applied Statistics and Probability for Engineers”, Wiley, India, 6 Edition, ISBN: 9788126562947.</li> <li>2. R. Johnson, “Probability and Statistics for Engineers”, Prentice India Ltd, 8 Edition, ISBN 13:978- 8120342132.</li> <li>3. S.P. Gupta, “Statistical Methods”, Paperback publication, 43 edition, ISBN: 9788180549892, 8180549895.</li> <li>4. Victor A. Bloomfield, “Using R for Numerical Analysis in Science and Engineering”, CRC Press, First Edition, ISBN: 9781315360492</li> </ol>								
<b>e-sources:</b> NPTEL Course lectures links: <ol style="list-style-type: none"> <li>1. <a href="https://www.youtube.com/watch?v=VVYLpmKRfQ8&amp;list=PL6C92B335BD4238AB">https://www.youtube.com/watch?v=VVYLpmKRfQ8&amp;list=PL6C92B335BD4238AB</a> (Probability)</li> <li>2. <a href="https://nptel.ac.in/courses/111104100">https://nptel.ac.in/courses/111104100</a> (Introduction to R software)</li> <li>3. <a href="https://www.youtube.com/watch?v=WbKije5OkUU&amp;list=PLFW6lRTa1g83jppIOte7RuEYCwOJa-6Gz">https://www.youtube.com/watch?v=WbKije5OkUU&amp;list=PLFW6lRTa1g83jppIOte7RuEYCwOJa-6Gz</a> (Descriptive statistics using R software)</li> </ol>								

<b>Program:</b>	S.Y.B. Tech. (E&TC)			<b>Semester:</b>		IV		
<b>Course:</b>	OE-Engineering Science: E-Waste Management (Offered by Civil Department)			<b>Code:</b>		BCI24OE01		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme and Marks</b>				
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>	
				<b>FA 1</b>	<b>FA 2</b>			
<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>	
<b>Prior Knowledge:</b>								
<ol style="list-style-type: none"> <li>1. Fundamentals of environmental science.</li> <li>2. Fundamentals of sustainable development.</li> </ol>								
<b>Course Objectives:</b> This course aims at enabling students,								
<ol style="list-style-type: none"> <li>1. To impart the knowledge of issues and challenges of e-waste management.</li> <li>2. To create awareness of potential health effects and risk associated with e-waste.</li> <li>3. To build knowledge of e-waste legislation (policy and guidelines) and circular economy.</li> <li>4. To get acquainted with recycling, recovering and disposal techniques.</li> </ol>								
<b>Course Outcomes:</b> After learning the course, the students should be able to:								
<ol style="list-style-type: none"> <li>1. Identify the issues and challenges of e-waste management for a sustainable environment.</li> <li>2. Analyze potential health effects and risk assessment.</li> <li>3. Illustrate e-waste laws and guidelines and apply a circular economy road map for an e-waste sustainable future.</li> <li>4. Identify the e-waste recycling, recovery and disposal techniques and its significance for a sustainable future.</li> </ol>								
<b>Detailed Syllabus</b>								
<b>Unit</b>	<b>Description</b>						<b>Duration (H)</b>	
<b>1</b>	<b>Electronic Waste Management – Issues and Challenges:</b> Introduction to E-Waste, classification and composition, need to manage / recycle, E-Waste generation in India and comparison with world scenario; facts & figures, estimation of waste electronic and electrical equipment (WEEE), economic assessment of E-Waste (Rare earth minerals, precious metals), effluents (solid, liquid and gas) generated during recycling, quantification of health hazard due to informal recycling of E-Waste, (Case study-based learning)						7	
<b>2</b>	<b>E-Waste-Environmental and Public Health Issue:</b> Characteristics of Hazardous Substances, toxicity concerns, potential health effects and symptoms of long-term exposure, case study of heavy metal contamination due to E-Waste recycling, Introduction to risk assessment, epidemiologic data analysis and parameter for determining exposure and disease (numerical), classification of potential carcinogens, dose-response assessment, Potency Factor for Carcinogens (numerical), Hazard Index (HI) and Hazard Quotient (HQ) (numerical)						8	
<b>3</b>	<b>E-Waste (Management &amp; Handling) Rules / Guidelines and Circular Economy:</b> Regulatory frameworks in India, objectives of e-waste rules 2016,2018,2022 and 2024, hazardous and other wastes (Management and Transboundary Movement) Rules, application of rules to stakeholders, India's stand on liberalizing import rules, UN Sustainable Development Goals (SDGs) and E-Waste, circular economy startup in India with a case study.						7	
<b>4</b>	<b>Recycling and Recovery of Metals from Electronic Waste and Disposal Techniques:</b> E-Waste recycling machineries, recycling process of E-Waste, existing E-Waste recycling Techniques, case study/ examples (metal recovery process), mechanism of extraction of precious metal from leaching solution, recovery of precious metals from solutions by solvent extraction, extraction of precious and rare earth metals from End-of- Life (EOL) electronic products, disposal techniques, role and responsibility of extended producers' responsibility (EPR), E-Waste economy in the organized and unorganized sector, Case study on recycling and precious metal recovery from E-Waste.						8	

<b>Program:</b>	<b>S.Y.B. Tech. (E&amp;TC)</b>	<b>Semester: IV</b>
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<b>Total</b>	<b>30</b>
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. E-Waste management challenges and opportunities in India, Varsha Bhagat Ganguly, Routledge India, 1<sup>st</sup> edition 2021.</li> <li>2. E-Waste Management and procurement of Environment, Dr. Suresh Kumar and Dr. Jitendra Kumar Pradhan, Authorpress, 2021 edition.</li> <li>3. E-Waste in India: Management, challenges and opportunities (Volume I &amp; II), Dr. Suresh Kumar, Authorpress, September, 2021 edition.</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Fowler B, Electronic Waste – 1st Edition (Toxicology and Public Health Issues), 2017 Elsevier</li> <li>2. Johri R., E-waste: implications, regulations, and management in India and current global best practices, The Energy and Resources Institute (TERI) TERI Press, New Delhi, 2008.</li> <li>3. The Complete Technology Book on E-Waste Recycling (Printed Circuit Board, LCD, Cell Phone, Battery, Computers), ASIA PACIFIC BUSINESS PRESS Inc., 2015.</li> </ol>	
<b>e-Resources</b>	
<ol style="list-style-type: none"> <li>1. <a href="https://cpcb.nic.in/e-waste/">https://cpcb.nic.in/e-waste/</a></li> <li>2. <a href="https://courses.iid.org.in/course/e-waste-recycling-business">https://courses.iid.org.in/course/e-waste-recycling-business</a></li> <li>3. <a href="https://www.suritex.co.in/">https://www.suritex.co.in/</a></li> <li>4. <a href="http://greenscape-eco.com/">http://greenscape-eco.com/</a></li> <li>5. <a href="https://onlinecourses.nptel.ac.in/noc20_ce12/preview">https://onlinecourses.nptel.ac.in/noc20_ce12/preview</a></li> <li>6. <a href="https://nielit.gov.in/gangtok/content/paid-course-e-waste-management">https://nielit.gov.in/gangtok/content/paid-course-e-waste-management</a></li> <li>7. <a href="https://www.semanticscholar.org/paper/Electronic-waste-management-Hester-Harrison/bc34471b0f9d94b0656b43df6b322116f2a7175c">https://www.semanticscholar.org/paper/Electronic-waste-management-Hester-Harrison/bc34471b0f9d94b0656b43df6b322116f2a7175c</a></li> </ol>	



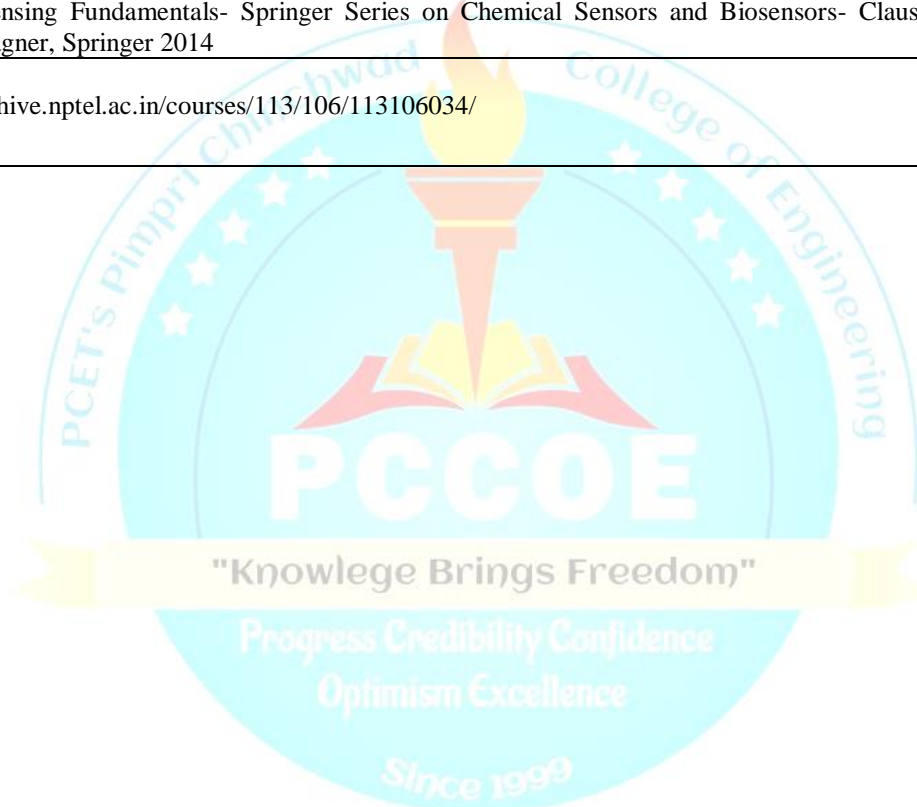
<b>Course:</b>	<b>Advanced Materials and Characterizations</b> (OEC-Engineering Sciences Offered by AS&H)				<b>Code:</b>	<b>BSH24OE05</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
02	02	-	-	0	10	10	30	50
<b>Prior knowledge of:</b> basic physics, chemistry and nanotechnology is essential.								
<b>Course Objectives:</b> This course aims at enabling students, 1. To learn the principles of advanced materials, technologies and characterizations. 2. To undertake research projects with applications of advanced materials.								
<b>Course Outcomes:</b> After learning the course, the students should be able to: 1. Interpret structure, properties and applications of advance engineering materials. 2. Explain the properties and requirements of materials for some advanced applications 3. Analyze structural, optical, elemental & morphological properties of the materials 4. Analyze electrochemical & thermal properties of the materials								
<b>Detailed Syllabus</b>								
<b>Unit</b>	<b>Description</b>							<b>Duration [Hrs]</b>
1	<b>Engineering Materials:</b> Polymer Composite eg. fiber- reinforced polymer (FRP) composites Advanced carbon materials eg. Graphene & CNT Alloys: a) Nano alloy eg. Cu-Ni nano alloy b) Memory alloy-Nitinol CdSe Thin films for solar cells.							7
2	<b>Materials for Special applications:</b> Battery and Supercapacitor: working principles, components, material requirement and properties of electrodes, electrolytes and spacers, Superconductors: Metallic, nonmetallic and ceramic superconductors, Applications, Gas Sensing: working principle and required material properties. Substrate Materials for quantum computer, Invar and Elinvar Materials: properties and applications, 2D materials: properties and their applications							7
3	<b>Structural, Optical, Elemental &amp; Morphological Characterizations :</b> X-Ray Diffraction and phase identification, indexing lattice parameter determination, Grain size analysis, EDAX, Electron microscopy, scanning electron microscopy, Transmission electron microscopy (TEM), Fourier Transform Infrared Spectroscopy, Band gap measurements-UV Vis- IR Spectroscopy							8
4	<b>Electrochemical and Thermal Characterizations:</b> Cyclic voltammetry: Instrumentation, current potential relation applicable for Linear Sweep Voltammetry (LSV) and Cyclic Voltammetry (CV), interpretation of cyclic voltammograms, charging-discharging behaviors of supercapacitor and batteries. Thermo-gravimetric analysis (TGA), Differential thermal analysis (DTA) analysis, Thermal expansion measurements, Thermal conductivity measurements, Ionic conductivity measurements. Specific heat capacity measurements, Debye temperature measurements							8
	<b>Total</b>							<b>30</b>
<b>Text Books:</b> 1. Transmission electron microscopy: a textbook for materials science, David B. Williams, C. Barry Carter, Springer, 2009 2. Advanced solid state physics-Graduate Texts in Condensed Matter, Hendrik Bluhm, Thomas Brückel, Markus Morgenstern, Gero Plessen, Christoph Stampfer, de Gruyter 2019								

**Reference Books:**

1. Elements of X-ray Diffraction, B.D. Cullity and S.R. Stock, Pearson Publication, Third edition 2014.
2. Introduction to Fuel Cells, Electrochemistry and Materials, San Ping Jiang, Qingfeng Li, Springer Publication, 2022.
3. Solid State Physics, S.O.Pilli, New age, International Publication Tenth edition 2022.
4. Introduction to Solid State Physics, C. Kittel, 8th edition Wiley, 2005.
5. Introduction to Superconductivity, Michael Tinkham, 2nd edition, Dover Publication 2004.
6. Electrochemical super capacitors, B. E. Conway, Springer, 1999.
7. Spectroscopy, G.R. Chatwal and S.K. Ananad, Himalaya Publications, 2016.
8. Introduction to Thermal Analysis, M.E. Brown, Kluwer academic Publishers, 2nd edition 2001.
9. Electrochemical Methods: Fundamentals and Applications, A, J Bard, Allen J. Bard, Larry R. Faulkner, Henry S. White, John Wiley & Sons, 31 May 2022.
10. Microscopy A Very Short Introduction by Srivastava, Oxford University Press, 2015.
11. Practical Guide to materials Characterization, Khalid Sultan, Wiley-VCH, 2023
12. Engineering Chemistry by Wiley India Pvt.Ltd,First edition 2011.
13. Introduction to Nanotechnology by Charles P. Poole, Frank Owens, John Wiley & Sons (2003)
14. Gas Sensing Fundamentals- Springer Series on Chemical Sensors and Biosensors- Claus-Dieter Kohl, Thorsten Wagner, Springer 2014

**e-sources:**

1. <https://archive.nptel.ac.in/courses/113/106/113106034/>



<b>Program:</b>	S.Y.B. Tech. ( E&TC)					<b>Semester: IV</b>	
<b>Course:</b>	Data Science (OEC-Engineering Sciences offered by CSE- AIML Department)					<b>Code:</b> BCS24OE02	
<b>Credit</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
<b>02</b>	<b>02</b>	-	-	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Course Objectives:</b>							
<ol style="list-style-type: none"> <li>To demonstrate the use of mathematical techniques in the field of data science.</li> <li>To explain the theory of statistics for its use in statistical inference.</li> <li>To perform the data preprocessing operations.</li> <li>To demonstrate the use of data visualization and data analytics techniques</li> </ol>							
<b>Course Outcomes:</b>							
After learning the course, the students will be able to:							
<ol style="list-style-type: none"> <li>Understand data science life cycle phases and analyze the need of data preprocessing</li> <li>Analyze the need for data visualization and apply descriptive/inferential statistics for data analysis.</li> <li>Solve the regression/classification problem for data analysis and apply the model evaluation techniques using different performance measures.</li> <li>Apply data science in various domains.</li> </ol>							
<b>Detailed Syllabus</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration (H)</b>
1	<b>Introduction to Data Science and Data Preprocessing:</b> Introduction to Data Science: Data Science Life Cycle, Data Analytics and Types, Key performance indicators of data science projects. Data Preprocessing: Need, preprocessing techniques for: handling redundant data, data transformation, replacing or handling missing data, and handling data inconsistency.						8
2	<b>Data Visualization and Hypothesis Testing:</b> Data Visualization: Introduction, need, Data visualization techniques: line plot, scatter plot, histogram, density plot, box plot, bar plot, pie chart, heatmap, etc.  Statistics and Inference – Measures of central tendency, Measures of variability: standard deviation, variance, quartiles, Interquartile range. Skewness and Kurtosis.  Sampling and Inference - Sampling: Introduction, types of sampling. Hypothesis testing, types of errors, level of significance, test of hypothesis: t-test, z-test, Correlation analysis: Pearson’s correlation coefficient.						8

3	<p><b>Model Evaluation for Regression and Classification :</b>  Performing a linear Regression: Linear function, Fitting the line, residual errors, coefficient of determination.  Performing a logistic Regression: Logistic function, fitting the curve, understanding the log-odds, R-Squared.  Performing classification: Naive Bayes classifier.  Model Evaluation and Selection: holdout method, random sub-sampling, cross-validation. Model's parameter tuning and optimization. Performance metrics for evaluation of model, confusion matrix, AUC-ROC analysis</p>	8
4	<p><b>Applications of Data Science:</b>  Case study on Smart cities: the role of Internet of Things and machine learning,  Energy consumption: Machine Learning models for energy consumption forecasting ,  Supply Chain: Supply chain optimization using machine learning ,  Finance : Fraud detection and prevention in finance,  Healthcare: Machine learning for Breast cancer prediction</p>	6
<b>Total</b>		<b>30</b>
<p><b>TextBooks:</b>  1. Thomas Nield, "Essential Math for Data Science", O'Reilly Media Inc., October 2022, ISBN: 9781098102869.  2. Data Science and Big Data Analytics, EMC education services, Wiley publication, 2015, ISBN: 9781118876138.</p>		
<p><b>Reference Books:</b>  1. Peter Bruce, Andrew Bruce, Peter Gedeck, "Practical Statistics for Data Scientists", O'Reilly Media, 2nd edition, May 2020, ISBN: 9781492072942.  2. Norman Matloff, "Probability and Statistics for Data Science", CRC Press, 2019, ISBN:9780429687112</p>		
<p><b>e-sources:</b>  1. NPTEL Course on "Python for Data Science" :<a href="https://onlinecourses.nptel.ac.in/noc22_cs74/preview">https://onlinecourses.nptel.ac.in/noc22_cs74/preview</a>  2. NPTEL Course on "Data Science for Engineers" :<a href="https://onlinecourses.nptel.ac.in/noc22_cs72/preview">https://onlinecourses.nptel.ac.in/noc22_cs72/preview</a></p>		

<b>Program:</b>	S.Y.B.Tech. (E&TC)			<b>Semester:</b>	IV		
<b>Course:</b>	Operating System's Administration (OEC-Engineering Sciences offered by IT Department)			<b>Code:</b>	BIT24OE01		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
2	2	0	0	10	10	30	50
<b>Prior knowledge of:</b>							
1. Computer Programming is essential							
<b>Course Objectives:</b>							
1. To learn and understand basics of Operating Systems including Boot process.							
2. To learn and understand Shells Scripts and File System							
3. To introduce the administrative features of Operating System							
<b>Course Outcomes:</b>							
After learning the course, the students will be able to:							
1. Explain basic knowledge of Unix /Linux Operating System							
2. Apply basic shell scripts and admin commands for Operating System tasks.							
3. Make use of process controlling and monitoring commands and network monitoring							
4. Experiment the administrative features of Linux Operating System							
<b>Detailed Syllabus</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration (H)</b>
1.	<b>Introduction to Operating System</b> General Overview: History of Linux/Unix, System Structure, User perspective, Operating system Services, Assumptions about Hardware Introduction to Kernel: Architecture of Unix operating system, Introduction to the system concepts, Kernel data structure, System Administration						6
2.	<b>Booting and Shut Down, Shell Scripting</b> Bootstrapping, Booting PCs, GRUB, Booting with single user mode, Rebooting and Shutting down. Shell Basics, bash scripting, Scripting Best Practices, Working with Startup Scripts.						8
3.	<b>Access Control and Controlling Processes</b> Components of a process, the lifecycle of a process, Signals, Kill, Process states, nice and renice, ps, Dynamic monitoring with top, prstat and topas, the /proc file system Network Administration: Network Monitoring, Network Management						8
4.	<b>Adding New Users and Storage</b> The /etc/passwd file, The /etc/shadow and /etc/security/passwd files, /etc/group file, Adding users, Adding users with useradd Storage: Adding a hard Disk, Storage Hardware, Storage hardware Interfaces, Software aspects of storage, Formatting, Disk Partitioning, RAID Linux File System: The ext family, file system terminology, file system polymorphism, mkfs, fsck, file system mounting, setup for automatic mounting, USB drive mounting						8
<b>Total</b>						<b>30</b>	
<b>Text Books:</b>							
1. Maurice J. Bach. The Design of the Unix Operating System. Prentice-Hall							
2. Sumitabha Das. Unix: Concepts and Applications. 4 <sup>th</sup> Edition, McGraw Hill Education, 2017.							
<b>Reference Books:</b>							
1. Evi Nemeth, Garth Snyder, Tren Hein, Ben Whaley. Unix and Linux System Administration Handbook. Fourth Edition, 2011.							
<b>E-resources:</b>							
1. <a href="https://www.coursera.org/learn/system-administration-it-infrastructure-services">https://www.coursera.org/learn/system-administration-it-infrastructure-services</a>							

<b>Program :</b>	S.Y. B Tech.(E&TC)				<b>Semester: IV</b>			
<b>Course :</b>	Material Science (OEC-Engineering Sciences offered by Mechanical Department)				<b>Code :</b>	BME24OE0 1		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
<b>2</b>	<b>2</b>	<b>-</b>			<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Pre requisite : Nil</b>								
<b>Course Objectives:</b> This course aims at enabling students, 1. To Acquaint students about materials, their properties, structure property relationship. 2. To create awareness about the importance of materials information in engineering.								
<b>Course Outcomes:</b> After learning the course, the students should be able to: 1. Compare different materials based on their structures 2. Relate the structure of materials with their properties. 3. Suggest suitable material for given application based on its structure and properties.. 4. Explore advanced materials in engineering applications.								
<b>Detailed Syllabus:</b>								
<b>Unit</b>	<b>Description</b>							<b>Duration [H]</b>
1	Introduction to materials: Classification of materials, structure of materials :Atomic structure, crystal structure and microstructure, material properties: Physical, Mechanical, Electrical, Magnetic etc.							8
2	Metals: Ferrous, non ferrous, alloys, structure and properties of commonly used metals, applications of metals in engineering.							7
3	Polymers: Structure of polymers and their properties, Thermoplastic and thermosetting plastics, advanced polymers such as temperature resistant polymers, shape change polymers, conducting polymers Ceramics: Structure of ceramics and their thermal, electrical and magnetic properties, applications of ceramics in engineering.							8
4	Composites: Classification of composite materials and their applications. Processing of advanced materials such as semiconductors.							7
	<b>Total</b>							<b>30</b>
<b>Text Books:</b> 1. Material Science and Engineering An Introduction, William D. Callister, Wiley Publication, 10 <sup>th</sup> Edition 2009. 2. Material Science and Metallurgy, Dr. V. D. Kodgire, Everest publishing house, 45th Edition, 2021.								
<b>Reference Books:</b> 1. Materials for Engineering, John Martin, Woodhead Publishing Limited, CRC Press, 3 rd Edition, 2006.								
<b>Online Courses:</b> NPTEL Course : Nature and properties of materials ( <a href="https://onlinecourses.nptel.ac.in/noc20_me13/course">https://onlinecourses.nptel.ac.in/noc20_me13/course</a> ) NPTEL Course : Properties of materials ( <a href="https://onlinecourses.nptel.ac.in/noc20_mm13/course">https://onlinecourses.nptel.ac.in/noc20_mm13/course</a> )								

<b>Program:</b>	<b>B. Tech. (E&amp;TC)</b>			<b>Semester :</b>	<b>IV</b>		
<b>Course :</b>	<b>Drawing for Engineers</b> (OEC-Engineering Sciences offered by Mechanical Department)			<b>Code :</b>	<b>BME24OE02</b>		
<b>Teaching Scheme</b>				<b>Evaluation Scheme</b>			
<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Credit</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
2	-	-	2	10	10	30	50
<b>Prerequisite: Nil</b>							
<b>Course Objectives:</b>							
<ol style="list-style-type: none"> <li>1. Develop imagination of physical objects for communication of Engineering Drawing.</li> <li>2. Develop the interpretation and manual drawing skills.</li> <li>3. Develop the physical realization of the dimension of the objects.</li> </ol>							
<b>Course Outcomes*:</b>							
After learning the course, students will be able to							
<ol style="list-style-type: none"> <li>1. <b>Understand</b> the basics of Engineering Graphics and <b>apply</b> the concepts in real life applications</li> <li>2. <b>Analyze</b> 3D engineering objects and draw orthographic projections</li> <li>3. <b>Analyze</b> 2D views of engineering objects and draw isometric views</li> <li>4. <b>Analyze</b> 3D objects and draw development of lateral surfaces of solid</li> </ol>							
<b>Detailed Syllabus</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration (H)</b>
1	<b>Part A: Introduction to engineering drawing</b> <b>Importance of engineering drawing to Civil, Electrical, Electronics, IT and Computer Engineers</b> , introduction to drawing instrument and their uses, drawing sheet layout and its sizes, types of lines and their applications, dimensioning terminology and methods <b>Part B: Projection of Points, Lines and Planes</b> Projection: Introduction to projection and different methods of projections, Projection of Point: Introduction, Point situated in all the quadrants. Projection of lines: Introduction, Projection of lines. Projection of Planes: Introduction, Types of planes, Projection of planes. <b>CPU circuit diagram, Electrical/Electronic board circuit diagram, Building floor plan</b>						8
2	<b>Orthographic projections</b> Orthographic projection of given real life components by first angle method of projection, types of sections.						7
3	<b>Isometric view</b> Isometric axes, scale, difference between isometric projection and isometric view, isometric view of simple solids and its dimensioning.						8
4	<b>Development of lateral surface of solids</b> Development of lateral surfaces of prism, pyramid, cylinder and cone. 3D and 2D drawing of branch specific industrial products and its lateral surface development.						7
	<b>Total</b>						<b>30</b>
<b>Text Books:</b>							
<ol style="list-style-type: none"> <li>1. Engineering Drawing with an introduction to AutoCAD- Dhananjay A. Jolhe, Revised Edition 2017, Tata McGraw Hill publishing company Ltd. New Delhi, India</li> <li>2. Engineering Drawing, Plane and solid geometry- N. D.Bhatt, 54<sup>th</sup> edition 2023, Charotor publication house.</li> </ol>							
<b>Reference Books:</b>							
<ol style="list-style-type: none"> <li>1. Engineering Drawing- M.B Shah and B.C Rana, 2<sup>nd</sup> edition 2009, Pearson Publications.</li> <li>2. Engineering Graphics- P.J. Shah, Revised edition 2019, S Chand Publications.</li> <li>3. Fundamentals of Engineering Drawing- Warren J. Luzzader, 11<sup>th</sup> edition 2015, Prentice Hall of India New Delhi.</li> <li>4. A text book of Engineering Drawing- R.K. Dhawan, Revised Edition 2019, S. Chand and company Ltd. New Delhi, India</li> </ol>							

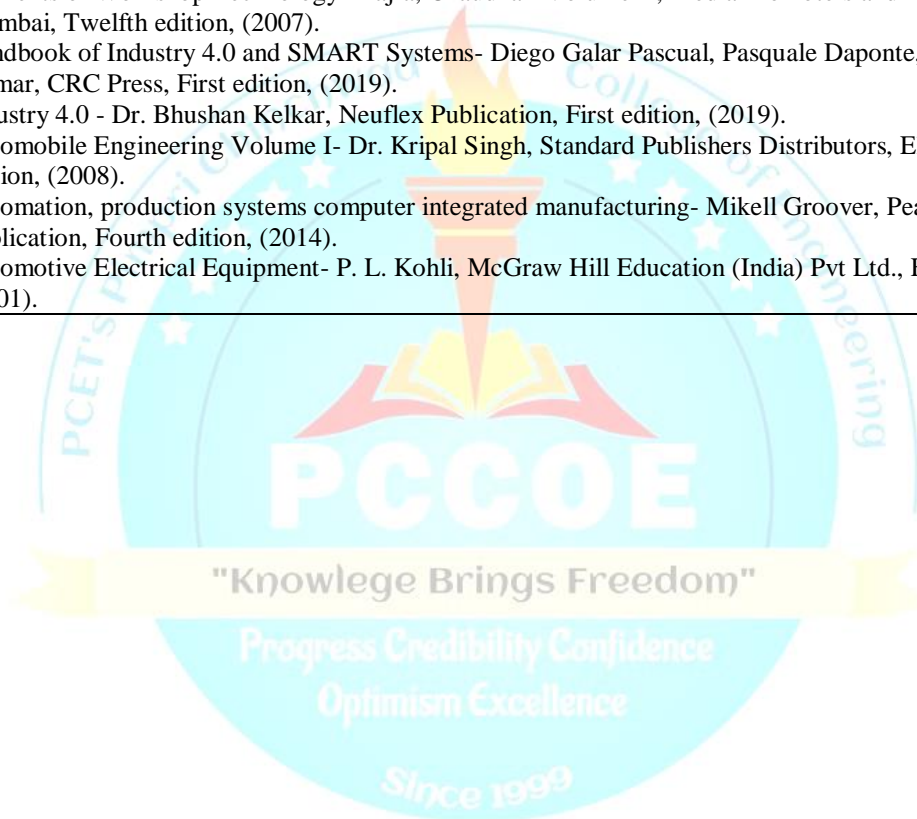
<b>Program :</b>		<b>B.Tech.( E&amp;TC)</b>			<b>Semester:IV</b>		
<b>Course :</b>		<b>Fundamentals of Mechanical Components and Systems</b> (OEC-Engineering Sciences offered by Mechanical Department)			<b>Code :</b>	<b>BME24OE03</b>	
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
<b>2</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prerequisites:</b> Nil							
<b>Course Objectives:</b> This course aims at enabling students, <ol style="list-style-type: none"> <li>1. Impart knowledge of mechanical engineering and describe the scope of mechanical engineering with multidisciplinary industries.</li> <li>2. Impart knowledge of basic concepts of thermodynamics and heat transfer applied to industrial applications.</li> <li>3. Understand, identify and get exposure to latest trends in manufacturing processes and materials.</li> <li>4. Describe the fundamentals of automobile systems and the emerging trends of electric vehicles, hybrid electric vehicles and solar vehicles..</li> </ol>							
<b>Course Outcomes:</b> After learning the course, the students should be able to: <ol style="list-style-type: none"> <li>1. <b>Identify</b> different materials and manufacturing processes for different applications.</li> <li>2. <b>Apply</b> the fundamentals of thermodynamics and heat transfer to real life applications.</li> <li>3. <b>Identify</b> the basic mechanical elements and the power transmission drives based on their applications.</li> <li>4. <b>Comprehend</b> automotive system for the combustion vehicle, EV's, HEV's and solar vehicles..</li> </ol>							
<b>Detailed Syllabus:</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration [Hrs]</b>
1	<b>Materials and Manufacturing Engineering</b> Classification of materials, their properties and applications, phase change material (PCM), composite material. Introduction to manufacturing processes: classification and applications, sheet metal working and forging. Introduction to industry 4.0.						8
2	<b>Thermal Engineering</b> Introduction to thermodynamics: concept of a system, types of systems, energy interactions: heat and work, laws of thermodynamics, entropy, and modes of heat transfer, thermal resistance, insulation. Applications of hydraulic turbines, centrifugal pumps, compressor, household refrigerator, window and split air conditioner.						7
3	<b>Fundamentals of Design Engineering</b> Introduction to mechanical engineering: use of mechanical engineering in day to day life and its interdisciplinary use, Introduction to design thinking. Machine elements, power transmission drives and mechanisms.						8
4	<b>Automotive Engineering</b> Classification of automobile, specifications of two wheeler, four wheeler and multi axle vehicles, types of chassis layout and drives, working of I.C. Engine, gear boxes, clutch, brakes, drive train system. Emission standards. Concept and environmental importance of electric vehicles (EV), construction and working of EV, hybrid electric vehicles (HEV) and solar vehicles, challenges and future scope of EV's and HEV's.						7
	<b>Total</b>						<b>30</b>

**Text Books:**

1. Basic Mechanical Engineering- Basant Agarwal and C. M. Agarwal, Wiley publication, First edition, (2008).
2. Engineering Thermodynamics- P. K. Nag, Tata McGraw-Hill publishing Co. Ltd., Sixth edition, (2017).
3. Heat and mass transfer- R. K. Rajput, S Chand publication, Revised edition, (2007).
4. A Textbook of Automobile Engineering- Khalil U Siddiqui, New Age International Publishers, Fifth edition, (2012).

**Reference Books:**

1. Design of Machine Elements- V. B. Bhandari, Tata McGraw-Hill publishing Co. Ltd., Fourth edition, (2017).
2. Theory of Machine- S. S. Ratan, Tata McGraw-Hill publishing Co. Ltd., Fifth edition, (2019).
3. Thermal Engineering- Arora and Domkunwar, Dhanpat Rai and Sons, Sixth edition, (2013).
4. Elements of Workshop Technology- Hajra, Chaudhari Volume I, Media Promoters and Publishers, Mumbai, Fourteenth edition, (2008).
5. Elements of Workshop Technology- Hajra, Chaudhari Volume II, Media Promoters and Publishers, Mumbai, Twelfth edition, (2007).
6. Handbook of Industry 4.0 and SMART Systems- Diego Galar Pascual, Pasquale Daponte, Uday Kumar, CRC Press, First edition, (2019).
7. Industry 4.0 - Dr. Bhushan Kelkar, Neuflex Publication, First edition, (2019).
8. Automobile Engineering Volume I- Dr. Kripal Singh, Standard Publishers Distributors, Eleventh edition, (2008).
9. Automation, production systems computer integrated manufacturing- Mikell Groover, Pearson Publication, Fourth edition, (2014).
10. Automotive Electrical Equipment- P. L. Kohli, McGraw Hill Education (India) Pvt Ltd., First edition, (2001).





# **VSEC Syllabus**

<b>Program: B. Tech. (E&amp;TC)</b>				<b>Semester :IV</b>			
<b>Course :Data Structures and Programming Lab.</b>				<b>Code : BET24VS01</b>			
Credits	Teaching Scheme ((Hrs. /Week)			Evaluation Scheme and Marks			
	Theory	Practical	Tutorial	TW	OR	PR	Total
2	-	4	-	50	-	50	100
<b>Prior knowledge of:</b> Programming & Problem Solving is essential.							
<b>Course Objectives:</b> During the course, teacher will <ol style="list-style-type: none"> <li>1. Explain and demonstrate the basics of C Programming language.</li> <li>2. Explain the comparison and demonstrate the different sorting and searching algorithms.</li> <li>3. Demonstrate the linear data structures such as Stacks, Queues, linked list and their applications.</li> <li>4. Demonstrate the linear data non-linear data structures such as binary trees, binary search trees and Graphs.</li> </ol>							
<b>Course Outcomes:</b> After completing the course, the students should be able to: <ol style="list-style-type: none"> <li>1. Solve the mathematical problem using the basic C Programming with arrays, structures, functions &amp; pointers.</li> <li>2. Implement the searching &amp; sorting algorithms.</li> <li>3. Develop applications of stack and queue using arrays and linked lists.</li> <li>4. Demonstrate the applicability of non-linear data structures such as Trees and graphs.</li> </ol>							
<b>General Guidelines: Perform all experiments to meet the above outcomes.</b> <b>Th: Theory Pr: Practical Pro: Mini Project</b>							
<b>Detailed Syllabus</b>							
Expt.No.	List of Experiments						
1	Introduction Data Structures (Th)						
2	Basics of C programming, Constant, Variable, Pointers, Functions (Th + Pr)						
3	Arrays (Th) Addition of two matrices (Pr) <ul style="list-style-type: none"> <li>• Online ticket booking (Pro)</li> </ul>						
4	Strings (Th) Basic operations (Pr) <ul style="list-style-type: none"> <li>• Spam email detection (Pro)</li> <li>• Plagiarism detection (Pro)</li> </ul>						
5	Searching and Sorting Algorithms (Th) Linear Search and Bubble Sorting (Pr) <ul style="list-style-type: none"> <li>• Online shopping. To sort prize in different range. For example :flipkart and amazon. (Pro)</li> </ul>						
6	Linked list (Th) Create, insert, delete node (Pr) <ul style="list-style-type: none"> <li>• To perform undo operation (Pro)</li> </ul>						
7	Stack (Th) Stack using array and LL (Pr) <ul style="list-style-type: none"> <li>• String reversal (Pro)</li> </ul>						
8	Queue (Th) Queue using array and LL (Pr) <ul style="list-style-type: none"> <li>• Sending an e-mail, it will be queued (Pro)</li> </ul>						
9	Tree (Th) Create BST, traversals (Pr) Databases using tree data structures for indexing (Pro)						
10	Graph (Th) Create graph, traversals (Pr) <ul style="list-style-type: none"> <li>• Facebook application (Pro)</li> </ul>						
11	Mini project						

Develop an unique application using data structures studied.
<b>Reference Books:</b> <ol style="list-style-type: none"><li>1. E. Balgurusamy, Programming in ANSIC, Tata McGraw-Hill, Eighth Edition, 2019.</li><li>2. Yashavant Kanetkar, —Data Structures Through C: Learn the fundamentals of Data Structures through C, BPB Publication, Third Edition, 2019.</li><li>3. Herbert Schildt, C: The Complete Reference, Tata McGraw-Hill, Fourth Edition, 2017.</li><li>4. Ellis Horowitz, Sartaj Sahni, —Fundamentals of Data Structures, Galgotia Books Source, Second Edition, 2008.</li><li>5. Reema Thareja, —Data Structures using C, Second Edition, Oxford University Press, 2014.</li></ol>





# **AEC Syllabus**

<b>Program:</b>	<b>B. Tech.</b>				<b>Semester: IV</b>				
<b>Course:</b>	<b>Professional Development Training (Offered by AS&amp;H)</b>				<b>Code:</b>	<b>BSH24AE05</b>			
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>				
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Others</b>	<b>Practical</b>			<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>	<b>TW</b>		
02	--	04	--		--	--	100	--	100
<b>Prior knowledge of:</b> Basic Mathematics & English									
<b>Course Objectives:</b> This course aims at enabling students: <ol style="list-style-type: none"> <li>To enhance the logical reasoning skills of the students and improve the problem-solving abilities.</li> <li>To improve the overall professional development of students.</li> </ol>									
<b>Course Outcomes:</b> After learning the course, the students will be able to: <ol style="list-style-type: none"> <li>Apply mathematical concepts to solve diverse numerical problems encountered in engineering, spanning arithmetic, algebra, geometry, and statistics.</li> <li>Employ deductive reasoning, interpret data, and discern patterns to navigate complex logical puzzles and analytical challenges typical of engineering aptitude tests and professional scenarios.</li> <li>Identify grammatical nuances, enhancing their verbal and written communication prowess essential for effective engineering discourse.</li> </ol>									
<b>Detailed Syllabus</b>									
<b>Unit</b>	<b>Description</b>								<b>Duration [Hrs]</b>
1	<b>Numerical Ability-I</b> HCF & LCM and Number System, Geometry, Ages, Allegations and Mixtures, Averages, Clocks and Calendars, Equations, Percentages, Profit and Loss, Ratios and Proportion, Series and Progressions, Time, Speed and Distance, Time and Work.								18
2	<b>Numerical Ability-II</b> Permutations and Combinations, Probability, Mean, Median, Mode, Standard Deviation, and Variance, Data Interpretation, Graphical Data Interpretation, Pie Charts, Tabular Data Interpretation, Simple Arithmetic Operations, Interest and Compound Interest, Linear equations, Quadratic equations, Triplets, Trigonometry								12
3	<b>Logical Reasoning</b> Clocks and Calendar, Direction sense, Family tree, Syllogism, Seating arrangement, Team formation, Coding and Decoding, Number Series and Letter Series, Ranking and Arrangements, Game-Based Aptitude.								12
4	<b>Verbal Ability &amp; Reading Comprehension</b> Subject-Verb Agreement, Articles and Other Determiners, Prepositions, Tenses, Parts of Speech, Active and Passive Voice, Direct and Indirect Speech, Conjunctions, Sentence Selection, Contextual Vocabulary, Error Spotting and Sentence Correction, Sentence Completion, Synonyms and Antonyms, Reading Comprehension, Jumble words & sentences. SMART Goal Setting & Career Road-map, Resume Writing & Linked-in Profile Building, Mock Interviews. Programming Language: Problem-solving & coding practice, Mock coding interviews								18
<b>Total</b>								<b>60</b>	
<b>Text Books:</b> <ol style="list-style-type: none"> <li>Arun Sharma, Quantitative Aptitude, 2016, 7th Edition, McGraw Hill Education Pvt. Ltd.</li> <li>ETHNUS, Aptimithra, 2013, 1st Edition, McGraw-Hill Education Pvt. Ltd</li> </ol>									
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>R S Aggarwal, Quantitative Aptitude For Competitive Examinations, 2017, 3rd Edition, S. Chand Publishing, Delhi.</li> <li>M. Tyra, Quicker Maths, 2018, 5th edition, 2018, BSC publishing company Pvt. Ltd</li> </ol>									



## **EEM-II Course Syllabus**

<b>Program :</b>	<b>B. Tech. (E&amp;TC)</b>			<b>Semester: IV</b>			
<b>Course :</b>	<b>Project Management</b>			<b>Code :</b>	<b>BET24EM01</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>			<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
				<b>FA1</b>	<b>FA2</b>		
<b>02</b>	<b>02</b>	<b>-</b>	<b>-</b>	<b>10</b>	<b>10</b>	<b>30</b>	<b>50</b>
<b>Prior knowledge of</b> a. Basic engineering fundamentals b. Introductory management concepts <b>is essential.</b>							
<b>Course Objectives:</b> This course aims at enabling students, 1. To understand the fundamental concepts of project management and their relevance in engineering and technology-driven environments. 2. To apply systematic techniques for project planning, scheduling, resource allocation, risk management, and quality control. 3. To gain exposure to modern project management tools, methodologies, and AI-enabled techniques for informed decision-making. 4. To develop competencies in project monitoring, reporting, documentation, and ethical decision-making throughout the engineering project lifecycle.							
<b>Course Outcomes:</b> After learning the course, the students should be able to: 1. Explain the fundamentals of project management, project life cycle stages, and the role of AI in project management. 2. Prepare project plans, schedules, and basic cost and resource estimates using appropriate project management tools and techniques. 3. Analyze project risks, quality requirements, and communication strategies with the support of AI-enabled tools. 4. Apply modern project management methodologies and digital tools to monitor, document, and close engineering projects.							
<b>Detailed Syllabus:</b>							
<b>Unit</b>	<b>Description</b>						<b>Duration [Hrs]</b>
1	<b>Fundamentals of Project Management &amp; AI Integration:</b> Concept of projects including definition and key characteristics with illustrative examples; distinction between projects and routine operations; overview of project life cycle phases including initiation, planning, execution, monitoring, and closure; role and responsibilities of a project manager; basic stakeholder identification and communication concepts; overview of project management methodologies including Waterfall, Agile, and Hybrid approaches; introduction to artificial intelligence in project management; role of AI in project planning and decision-making; and use of AI tools and large language models such as ChatGPT for basic project documentation.						07

2	<b>Project Planning, Scheduling &amp; Resource Management:</b> Concept of Work Breakdown Structure (WBS) and hierarchical decomposition of project tasks and deliverables; fundamentals of project scheduling using Gantt charts; introduction to network techniques including CPM and PERT with concepts of milestones and critical path; basics of resource planning and allocation for human resources, materials, and equipment; concept of resource leveling and optimization; fundamentals of cost estimation including cost types, baseline budgeting, and contingency planning; overview of artificial intelligence in project planning and scheduling; role of AI-driven scheduling tools, predictive resource allocation, and real-time demand forecasting in project planning.	08
3	<b>Project Risk, Quality &amp; Communication Management with AI:</b> Concept of project risk management including risk identification and mitigation; fundamentals of quality management covering planning, assurance, and control; basic testing and validation concepts in engineering projects; importance of project communication with emphasis on stakeholder engagement; introduction to AI applications in risk and quality management; use of AI for risk prediction, quality monitoring, and automated project reporting through dashboards.	07
4	<b>Project Execution, Monitoring &amp; Intelligent Practices:</b> Project execution and monitoring concepts including performance measurement; basics of Earned Value Management (EVM); change control and scope management; project documentation and closure including reports and post-implementation review; overview of Agile and hybrid project management practices; role of digital tools and dashboards in project execution; introduction to AI applications in project management including real-time monitoring, issue prediction, and automation; and use of intelligent assistants such as ChatGPT for project reporting and decision support.	08
<b>Total</b>		30
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. R. B. Khanna, <i>Project Management</i>, PHI Learning, Latest edition (2026) — Indian author textbook with project lifecycle and scheduling examples relevant to engineering.</li> <li>2. Kristian Baine, <i>AI-Driven Project Management: Harnessing the Power of Artificial Intelligence and ChatGPT to Achieve Peak Productivity and Success</i>, John Wiley &amp; Sons, 2024 — latest resource on AI applications in project management.</li> <li>3. Joseph Heagney, <i>Fundamentals of Project Management</i>, American Management Association, 2012</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Project Management Institute, <i>A Guide to the Project Management Body of Knowledge (PMBOK® Guide)</i> – Eighth Edition, 2025</li> <li>2. Erik W Larson, Clifford Gray, Rohit Joshi; <i>Project Management-The managerial process</i>, MacGraw Hill Publication, 2021</li> <li>3. Punmia, <i>Project Management with CPM /PERT</i>, Laxmi Publications, 2001</li> <li>4. Robert L Kimmons, <i>Project Management Basics</i>, Taylor &amp; Francis Ltd, 2018</li> <li>5. N. D. Vohra, <i>Quantitative Techniques in Management</i>, Tata McGraw Hill Book Co. Ltd.</li> <li>6. Jayant Deshmukh, <i>AI-Powered Project Management: 1000+ Practical Prompts for Planning, Scheduling &amp; Reporting</i></li> </ol>		

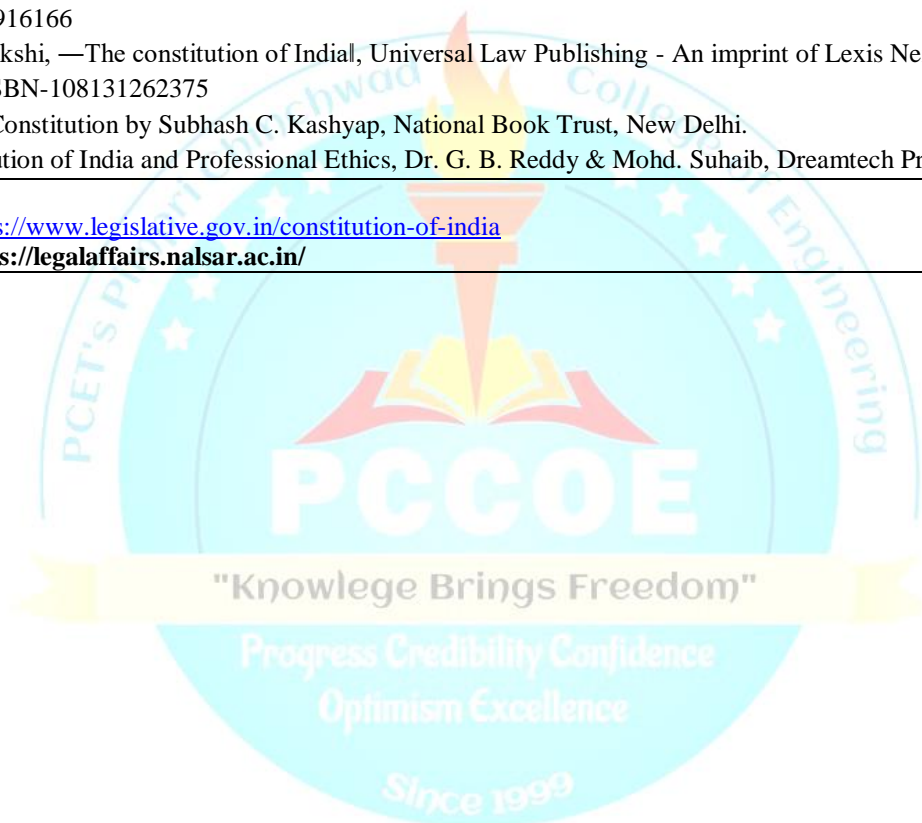


# **VEC Syllabus**

Since 1999

<b>Program:</b>	<b>B. Tech.</b>				<b>Semester: IV</b>			
<b>Course:</b>	<b>Constitution of India</b>				<b>Code:</b>	<b>BSH24VE02</b>		
<b>Credits</b>	<b>Teaching Scheme (Hrs./Week)</b>				<b>Evaluation Scheme and Marks</b>			
	<b>Lecture</b>	<b>Practical</b>	<b>Tutorial</b>	<b>Other</b>	<b>FA</b>		<b>SA</b>	<b>Total</b>
					<b>FA1</b>	<b>FA2</b>		
2	2	-		-	25	25	-	50
<b>Prior knowledge of:</b> Nil								
<b>Course Objectives:</b>								
<ol style="list-style-type: none"> <li>To introduce students to the fundamental principles, philosophy, and key features of the Indian Constitution.</li> <li>To familiarize students with the structure and functioning of government and key constitutional provisions.</li> <li>To enable students to apply constitutional values, rights, and duties in understanding contemporary issues and responsible citizenship.</li> </ol>								
<b>Course Outcomes:</b>								
After learning the course, the students will be able to,								
<ol style="list-style-type: none"> <li><b>Illustrate</b> the fundamental principles and key features of the Indian Constitution, including Preamble, Rights, Duties, and DPSP.</li> <li><b>Describe</b> the structure and functioning of the Executive, Legislature, and Judiciary, including the law-making process.</li> <li><b>Illustrate</b> constitutional provisions such as amendments, writs, and citizen mechanisms to address rights and governance issues.</li> <li><b>Apply</b> constitutional values to evaluate contemporary issues and challenges in civic and professional contexts.</li> </ol>								
<b>Detailed Syllabus</b>								
<b>Unit</b>	<b>Description: Times new Roman- Font size-11</b>							<b>Duration [Hrs]</b>
1	<b>Foundations of the Indian Constitution</b> <ul style="list-style-type: none"> <li>Introduction to the Indian Constitution: brief historical background, making of the Constitution, and its significance</li> <li>The Preamble: ideals, philosophy, and interpretation</li> <li>Salient features of the Indian Constitution: sovereignty, secularism, democracy, federalism, and rule of law</li> <li>Fundamental Rights and Fundamental Duties: concepts and relevance in contemporary society</li> <li>Directive Principles of State Policy (DPSP): objectives and role in governance</li> <li>Relationship between Fundamental Rights, Duties, and DPSP</li> </ul>							7
2	<b>Structure and Functioning of Government</b> <ul style="list-style-type: none"> <li>Union Executive: President, Vice-President, Prime Minister, and Council of Ministers—roles and functions</li> <li>Parliament: composition and functioning of Lok Sabha and Rajya Sabha</li> <li>Legislative process: stages of law-making (bill to act)</li> <li>Judiciary: structure, independence, and concept of judicial review</li> <li>Federalism: Centre–State relations and distribution of powers</li> <li>State Government: role of Governor and State Legislature (overview)</li> </ul>							8
3	<b>Constitutional Mechanisms and Citizen Interface</b> <ul style="list-style-type: none"> <li>Amendment process of the Constitution and basic structure doctrine</li> <li>Constitutional bodies: Election Commission of India and Comptroller and Auditor General—roles and functions</li> <li>Emergency provisions: national, state, and financial emergencies</li> <li>Constitutional remedies: writs and judicial remedies for protection of rights</li> <li>Public Interest Litigation (PIL): concept and significance</li> <li>Introduction to citizen-centric mechanisms: Right to Information (RTI)</li> </ul>							7

4	<p><b>Constitution in Contemporary Context</b></p> <ul style="list-style-type: none"> <li>● Judicial activism and its role in safeguarding constitutional values</li> <li>● Contemporary constitutional issues: freedom of speech, right to privacy, gender justice, and environmental protection</li> <li>● Challenges to constitutional governance: secularism, federalism, and social justice</li> <li>● Recent constitutional developments and amendments</li> <li>● Basic comparative perspective: Indian Constitution and selected global practices</li> </ul>	8
<b>Total</b>		<b>30</b>
<p><b>Text Books:</b></p> <ul style="list-style-type: none"> <li>● E I. Durga Das Basu, —Introduction to the Constitution of India —, Prentice Hall of India, New Delhi, 24th edition, 2020, ISBN-109388548868</li> <li>● Clarendon Press, Subhash C, Kashyap, — Our Constitution: An Introduction to India's Constitution and constitutional Lawl, NBT, 5th edition, 2014, ISBN-9781107034624</li> </ul>		
<p><b>Reference Books:</b></p> <ul style="list-style-type: none"> <li>● Maciver and Page, —Society: An Introduction Analysis —, Laxmi Publications, 4th edition, 2007, ISBN 100333916166</li> <li>● PM Bhakshi, —The constitution of India, Universal Law Publishing - An imprint of Lexis Nexis, 14th edition, 2017, ISBN-108131262375</li> <li>● Indian Constitution by Subhash C. Kashyap, National Book Trust, New Delhi.</li> <li>● Constitution of India and Professional Ethics, Dr. G. B. Reddy &amp; Mohd. Suhaib, Dreamtech Press.</li> </ul>		
<p><b>e-sources:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://www.legislative.gov.in/constitution-of-india">https://www.legislative.gov.in/constitution-of-india</a></li> <li>2. <a href="https://legalaffairs.nalsar.ac.in/">https://legalaffairs.nalsar.ac.in/</a></li> </ol>		



## Vision and Mission of E&TC Department

**VISION :** To be recognized as a distinguished department in the field of electronics and telecommunication transforming students into competent technocrats by providing an Ethical, Sustainable and Value-Added Quality Education.

**MISSION :**

1. To create competent Electronics and Tele-communication engineers with Knowledge, Skill and Attitude by establishing a conducive learning environment.
2. To nurture technical competency, entrepreneurship skills and promote higher studies through the state-of-art facilities for building successful careers.
3. To facilitate research by engaging in projects of industrial requirement and national importance.
4. To impart Life skills, Ethical and Social values for self-sustainability.

## Programme Educational Objectives (PEO's)

1. Establish a strong base in mathematics, basic sciences, and the fundamental principles of Electronics and Telecommunication Engineering for the students.
2. Equip students with a comprehensive understanding of Electronics and Telecommunication Engineering, enabling them to effectively comprehend, analyse, design, and to innovate practical solutions for real-world challenges.
3. Foster the development of effective communication skills, teamwork, and professional ethics among students, in order to meet the demands of employers and prepare them for higher studies and successful careers.
4. Promote social consciousness and a sense of responsibility among students, creating awareness about their commitment and obligations to society.

## Program Outcomes (PO's)

**PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

**PO2: Problem Analysis:** Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

**PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

**PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

**PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).

**PO6: The Engineer and The World:** Analyse and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

**PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

**PO8: Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

**PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

**PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

**PO11: Life-Long Learning:** Recognize the need for, and have the preparation and ability for  
i) independent and life-long learning ii) adaptability to new and emerging technologies and iii)  
critical thinking in the broadest context of technological change. (WK8)

## Program Specific Outcomes (PSOs)

1. **PSO1:** Ability to exhibit the competency to solve the problems related to Electronics & Telecommunications Engineering by applying advanced knowledge in the fields of VLSI, Embedded Systems, Signal Processing, Communication, Computing and Automation.
2. **PSO2:** Ability to design and analyse Electronics & Telecommunications systems using state of the art hardware and software tools to address the needs of the industry and society.
3. **PSO3:** Ability to build research and problem-solving attitude through Project based learning to address the societal, environmental, health and safety issues.

