Your Dreams Our Goal

POORNIMA UNIVERSITY

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SCHEME & SYLLABUS BOOKLET

BATCH 2022-2026

SCHEME & SYLLABUS

BATCH: 2022-26

B.Tech. in Electrical & Computer Engineering

INDEX

Disclaimer: The scheme, syllabus and other materials published in this booklet may be changed or modified as per the requirement after approval of competent authority. The decision taken by the management of Poornima University will be final and abiding to all.

Student Details

Name of Student:

Name of Program:

Semester: Year: Batch:

Faculty of:

Your Dreams Our Goal

POORNIMA UNIVERSITY

Member of Association of Indian Universities & Approved by UGC (Govt. of India) under 2(f) & 12(B)

VISION

To create knowledge based society with scientific temper, team spirit and dignity of labor to face global competitive challenges.

Mission

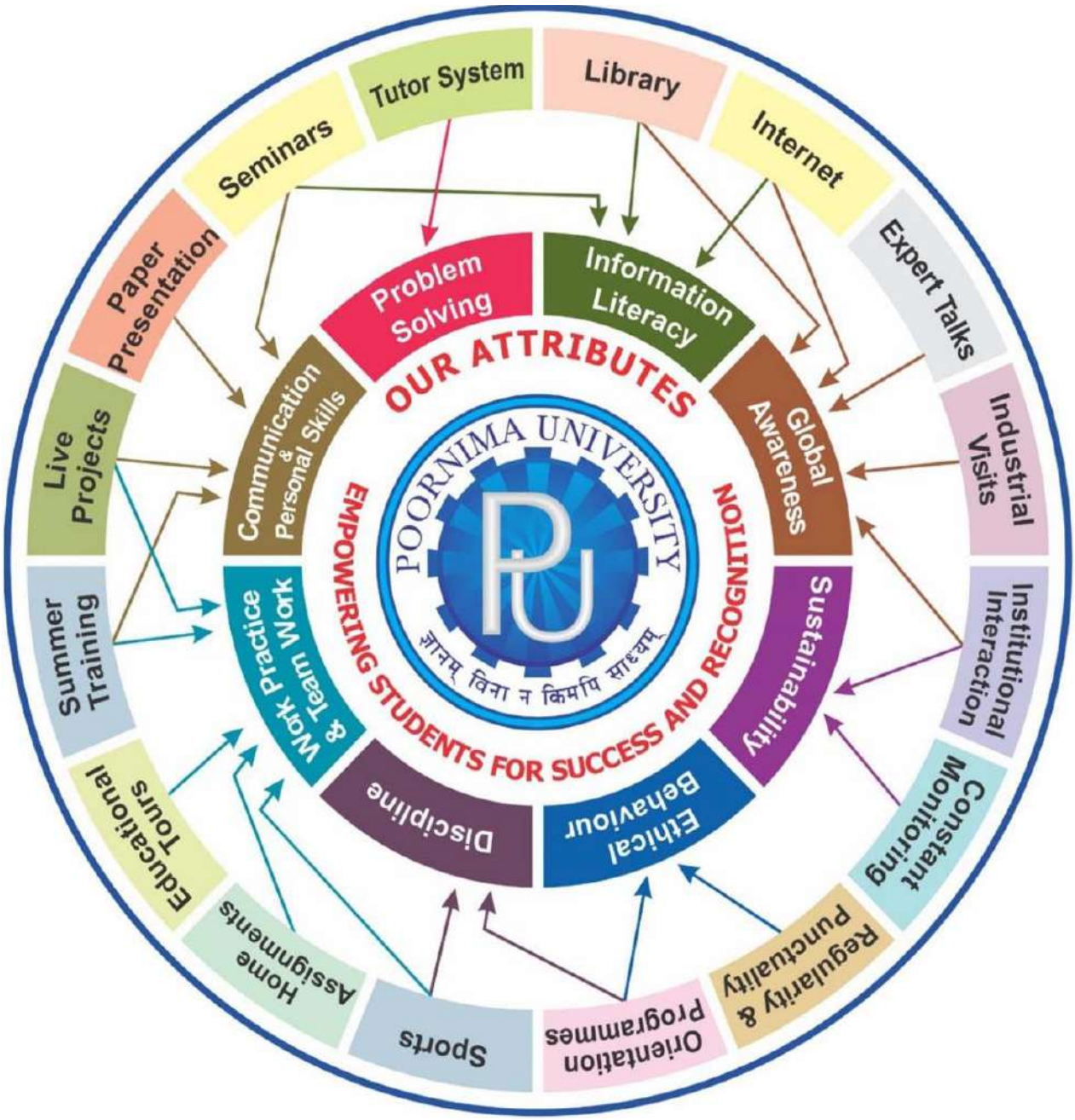
To evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

Quality Policy

To provide Quality Education through Faculty development, updating of facilities and continual improvement meeting University norms and keeping stake holders satisfied.

Knowledge Wheel

At Poornima, the academic atmosphere is a rare blend of modern technical as well as soft skills and traditional systems of learning processes.



About Program and Program Outcomes (PO):

Title of the Programme: Bachelor of Technology (B. Tech.)

Nature of the Programme: B. Tech. is four year full-time programme.

Program Outcomes (PO) :

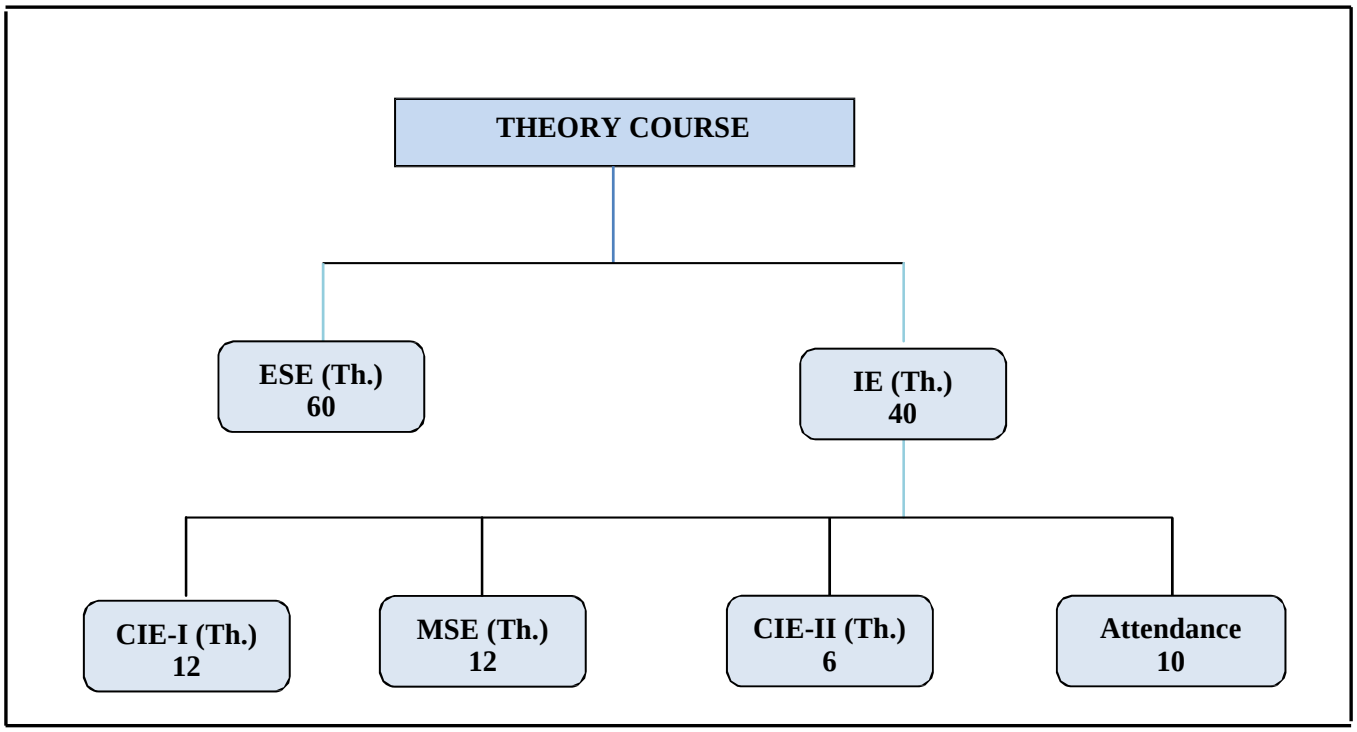
Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

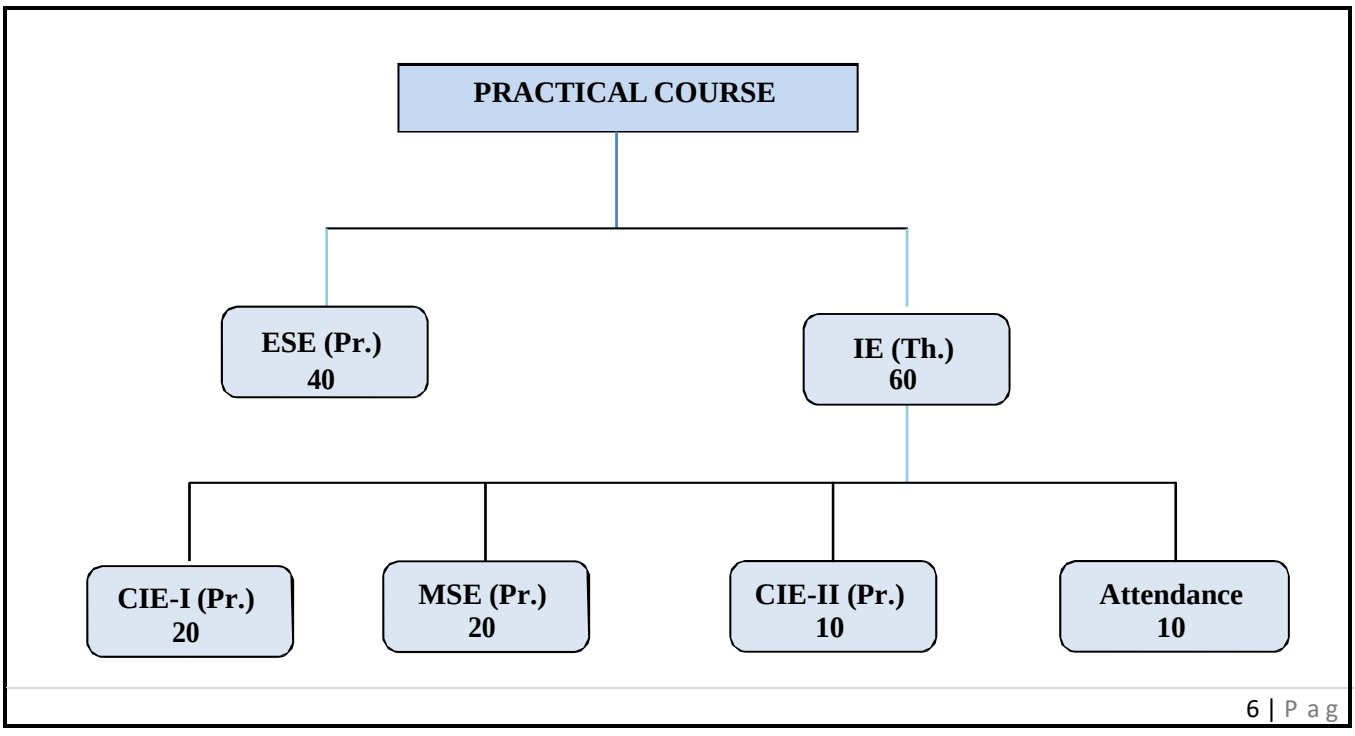
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Examination System:

A. Marks Distribution of Theory Course:



C. Marks Distribution of Practical Course:



Th. : Theory, **Pr.** : Practical, **ESE:** End Semester Examination, **MSE:** Mid Semester Examination, **CIE:** Continuous Internal Evaluation.

Marks Distribution of Attendance:

Guidelines for Marks Distribution of Attendance Component		
S No.	**Total Course Attendance (TCA) range in Percentage**	**Marks allotted (out of 10)**
1	95% ≤ TCA	10
2	90% ≤ TCA < 95%	9
3	85% ≤ TCA < 90%	8
4	80% ≤ TCA < 85%	7
5	70% ≤ TCA < 80%	6
6	60% ≤ TCA < 70%	5
7	50% ≤ TCA < 60%	4
8	40% ≤ TCA < 50%	3
9	30% ≤ TCA < 40%	2
10	20% ≤ TCA < 30%	1
11	TCA < 20%	0

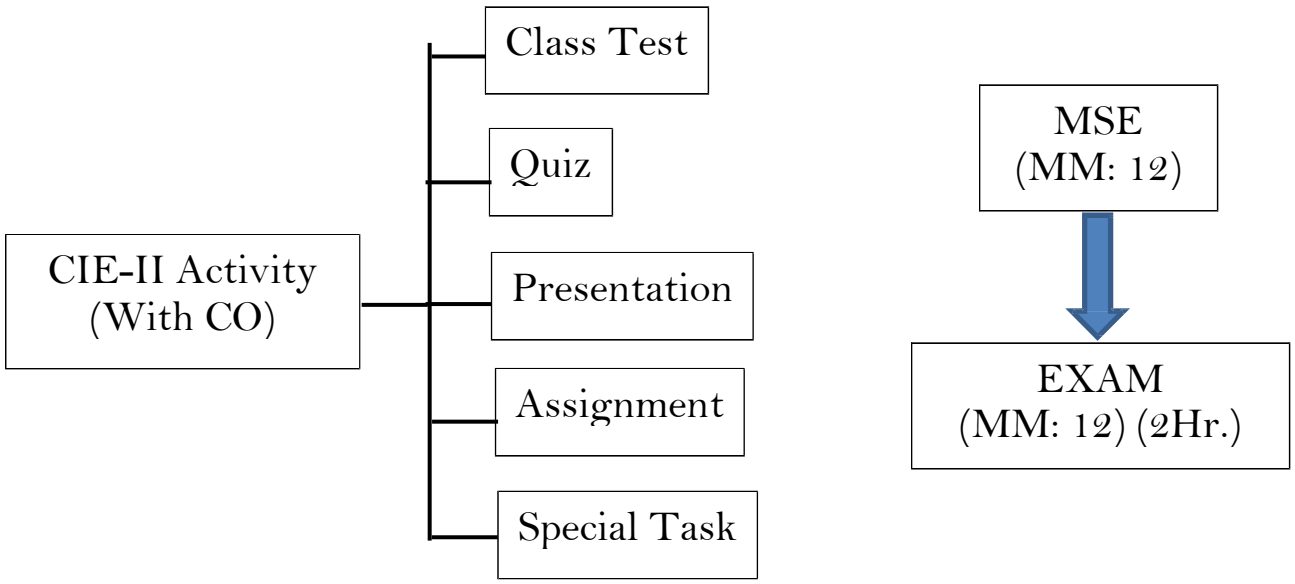
CO Wise Marks Distribution:

	Theory Subject		**Practical/ Studio Subject**	
	Maximum Marks	**CO to be Covered**	**CO to be Covered**	**Maximum Marks**
CIE-I (Class Test)	12 (6 + 6)	1 & 2	1 & 2	20 (10 + 10)
MSE	12 (6 + 6)	3 & 4	3 & 4	20 (10 + 10)
CIE-II (Activity/ Assignment)	6 (6)	5	5	10 (10)
Attendance	10	-	-	10
ESE	60	-	-	40
TOTAL	100	-	-	100

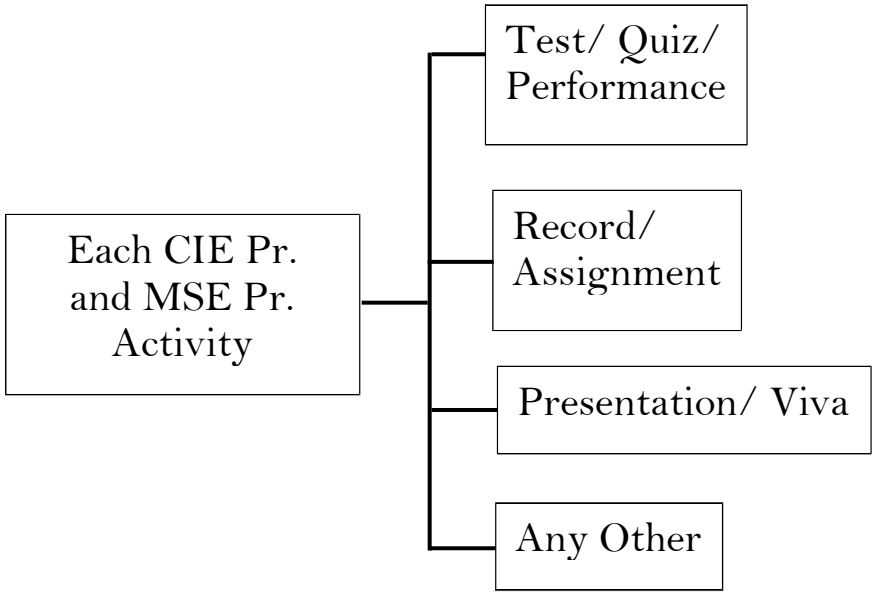
Minimum Passing Percentage in All Exams:

S. No.	Program	Minimum Passing Percentage in All Exam	
		ESE Component	**Total Component**
1	Course Work for Ph. D Registration	----------	**50 %**
2	B. Arch.	45 %	**50 %**
3	MBA, MHA, MPH, MCA, M. Tech., M. Plan. and M. Des.	40 %	40 %
4	B. Tech., B. Des., BCA, B.Sc., BVA, B. Voc., BBA, B.Com., B.A. and Diploma	35 %	40 %
5	B. Sc. (Hospitality & Hotel Administration)	35 %	40 % (Theory) & 50 % (Practical)

Break-up of Internal Exam (Theory):



Break-up of Internal Exam (Practical):



Assessment & Grade Point Average: SGPA, CGPA:

SGPA Calculation

$$\text{SGPA} = \frac{C_1G_1+C_2G_2+\cdots\ldots\ldots\ldots\ldots C_nG_n}{C_1+C_2+\cdots\ldots\ldots\ldots\ldots C_n}$$

$\text{SGPA} = \frac{\sum_i C_i x G_i}{\sum_i C_i}$	Where (as per teaching Scheme & Syllabus) : C_i is the number of Credits of Courses i, G_i is the Grade Point for the Course i and i = 1, 2…….n n = number of courses in a programme in the Semester

CGPA Calculation

$$\text{CGPA} = \frac{C_1G_1+C_2G_2+\cdots\ldots\ldots\ldots\ldots C_nG_n}{C_1+C_2+\cdots\ldots\ldots\ldots\ldots C_n}$$

$\text{CGPA} = \frac{\sum_i C_i x G_i}{\sum_i C_i}$	Where (as per teaching Scheme & Syllabus) : C_i is the number of Credits of Courses i, G_i is the Grade Point for the Course i and i = 1, 2…….n n = number of courses in a programme of all the Semester up to which CGPA is computed.

Grading Table:

Grading Table-A: For B.Arch. and course work for Ph.D. Registration

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	A+	10	$90 \leq x \leq 100$
Excellent	A	9	$80 \leq x < 90$
Very good	B+	8	$70 \leq x < 80$
Good	B	7	$60 \leq x < 70$
Average	C	6	$50 \leq x < 60$
Fail	F	0	$x<50$

Grading Table-B: For all courses except B.Arch. and course work for Ph.D. Registration

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	A+	10	$90 \leq x \leq 100$
Excellent	A	9	$80 \leq x < 90$
Very good	B+	8	$70 \leq x < 80$
Good	B	7	$60 \leq x < 70$
Average	C	6	$50 \leq x < 60$
Satisfactory	D	5	$40 \leq x < 50$
Fail	F	0	$x<40$

Calculation of SGPA $SGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$

$$SGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

Calculation of CGPA $CGPA = \frac{\sum_i C_i \times G_i}{\sum_i C_i}$

$$CGPA = \frac{C_1G_1 + C_2G_2 + \ldots\ldots\ldots + C_nG_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

where (as per teaching scheme & syllabus): C_i is the number of credits of subject **i**,
G_i is the Grade Point for the subject I and i = 1 to n, n = number of subjects in a course in the semester

Award of Class:

CGPA	Equivalent Division
7.50 ≤ CGPA	First Division with Distinction
6.50 ≤ CGPA < 7.50	First Division
5.50 ≤ CGPA < 6.50	Second Division
4.50 ≤ CGPA < 5.50	Pass Class

The multiplication factor for conversion of CGPA to percentage is Equivalent % of Marks = (CGPA-0.5) x 10.

For Example if CGPA = 5.5 then % is (5.5-0.5) x 10 = 50%.

Guidelines for MOOC COURSES:

1. Applicable from the session 2020 – 21 onwords, for students aspiring for HONOURS Degree.
2. The UGC has issued UGC (Credit Framework for Online Learning Courses) Regulation, 2016. These shall apply to all universities established or incorporated by or under a Central Act, a Provincial Act, or a State/Union Territory Act and all institutions recognized by or affiliated to such Universities and all institutions deemed to be universities under Section 3 of the UGC Act, 1956.
3. All India Council for Technical Education (AICTE) has introduced Model Curriculum for Bachelor programs of 4 years/ 3 Years, and additional credits will be required to be done for the degree of Bachelor program with Honours. These additional credits will have to be acquired with online courses (MOOCs) as per AICTE.
4. This creates an excellent opportunity for students to acquire the necessary skill set for employability through massive online courses where the rare expertise of world famous experts from academics and industry are available.
5. Students are required to complete additional credits through MOOCs within 4 years/ 3years of time (whatever be applicable time for the completion of registered program) so as to become eligible for Honours degree as per norms.
6. It is necessary to complete minimum MOOCs credit course as mentioned below for becoming eligible for the Honours degree in the registered program.
7. MOOC Course Credits shall be calculated as per details given below:
8. Student are required to give the prior information about MOOCs courses to his respective HOD and COE, in which he/she wants to register for online certification.
9. After getting permission from respective HOD, a student can register for the MOOC certification courses.
10. After successful completion of the said MOOC course, the student shall submit the certificate of completion to the respective department. If he/ she fails to provide the certificates of MOOC courses before last teaching day of the semester then these certificates will not be considered later.

Required credits for Honours :

S.No	Program Duration	Required credits for Honours
1.	2- Year	10- Credits
2.	3- Year	15- Credits
3.	4-Year	20- Credits

S. No	NPTEL/ SWAYAM Course duration (in weeks)	Equivalent Credits
1	4	2
2	8	3
3	12	4

Attached Items:

Open Elective Booklet	Annexure-1
Soft Skills Booklet	Annexure-2
Value Added Course Booklet	Annexure-3

POORNIMA UNIVERSITY

Faculty of Engineering & Technology
Faculty of Computer Science and Engineering

Department of First Year

Batch: 2022-26

Name of Programs

B.Tech. (ME/EE/Civil)	**B.Tech. (Electrical and Computer Engineering)**
B.Tech. ME/EE (spec. in Hybrid & Electric vehicles)	**B.Tech. (Computer Engineering)**

Teaching Scheme for Year I Semester I

Course Code	Course Name	Teaching Scheme (Hrs per Week)			Marks Distribution			Credits
		Lecture (L)	Tutorials (T)	Practical (P)	IE	ESE	Total	
A.	**University Core Courses**							
BULCSA1101	Environmental Studies	**2**	**-**	**-**	**40**	**60**	**100**	**2**
B.	**Department Core Courses**							
B.1	**Theory**							
BTXCSA1101 / BTXCSA1102	Engineering Mathematics / Engineering Physics	**3**	**1**	**-**	**40**	**60**	**100**	**3**
BTXCEE1103 / BTXCME1104	Electrical & Electronics Engineering / Engineering Mechanics	**3**	**1**	**-**	**40**	**60**	**100**	**3**
BTXCCE1105/ BTXCEE1106	Programming in C / Introduction to Futuristic Technologies	**3**	**-**	**-**	**40**	**60**	**100**	**3**
BTXCCE1107	Fundamental of computing	**3**	**-**	**-**	**40**	**60**	**100**	**3**
B.2	**Practical**							
BTXCME1201 / BTXCSA1202	Machine Drawing Lab/ Engineering Physics Lab-1	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCEE1203 / BTXCME1204	Electrical &Electronics Engineering Lab / Workshop Practice	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCCE1205 / BTXCME1206	Programming in C Lab / Practical Geometry	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCHM1207/ BTXCHM1208	Foundation English / Language Lab	**-**	**-**	**2**	**60**	**40**	**100**	**1**
C.	**Department Elective**							
	NIL							
D.	**Open Elective**							
	NIL							
E.	**Humanities and Social Sciences including Management courses (AECC)**							
	NIL							
F.	**Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship in Industry or Elsewhere**							
BTXCTX1301	Project	**-**	**-**	**4**	**60**	**40**	**100**	**2**
G.	**Discipline, VAC & Social Outreach**							
BTXCTX1601	Talent Enrichment Programme (TEP)	**-**	**-**	**-**	**50**	**-**	**50**	**1**
	Library / MOOC / Online Certification Courses	**1**	**-**	**-**				
	Non-Syllabus Project / Industrial Visit / CRT	**1**	**-**	**-**				
	Total	**16**	**05**	**12**				
	Total Teaching Hours	**33**						**21**

POORNIMA UNIVERSITY								
Faculty of Engineering & Technology **Faculty of Computer Science and Engineering**								
Department of First Year								
Batch: 2022-26								
Name of Programs **B.Tech. (ME/EE/Civil)**		**B.Tech. ME/EE (spec. in Hybrid & Electric vehicles)** **B.Tech. (Electrical and Computer Engineering**						
Teaching Scheme for Year I Semester II								
Course Code	**Course Name**	**Teaching Scheme (Hrs per Week)**			**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorials (T)**	**Practical (P)**	**IE**	**ESE**	**Total**	
A.	**University Core Courses**							
	NIL							
B.	**Department Core Courses**							
B.1	**Theory**							
BTXCSA2101	Engineering Chemistry	**3**	**-**	**-**	**40**	**60**	**100**	**3**
BTXCSA2102 / BTXCSA2103	Engineering Mathematics / Engineering Physics	**3**	**1**	**-**	**40**	**60**	**100**	**3**
BTXCEE2104 / BTXCME2105	Electrical & Electronics Engineering / Engineering Mechanics	**3**	**1**	**-**	**40**	**60**	**100**	**3**
BTXCCE2106/ BTXCEE2107	Programming in C / Introduction to Futuristic Technologies	**3**	**-**	**-**	**40**	**60**	**100**	**3**
B.2	**Practical**							
BTXCSA2201	Engineering Chemistry Lab		**-**	**2**	**60**	**40**	**100**	**1**
BTXCME2202 / BTXCSA2203	Machine Drawing Lab / Engineering Physics Lab-1	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCEE2204 / BTXCME2205	Electrical &Electronics Engineering Lab / Workshop Practice	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCCE2206 / BTXCME2207	Programming in C Lab / Practical Geometry	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCHM2208/ BTXCHM2209	Foundation English / Language Lab	**-**	**-**	**2**	**60**	**40**	**100**	**1**
C.	**Department Elective**							
	NIL							
D.	**Open Elective: Anyone**							
	As per Annexure-I	**2**	**-**	**-**	**40**	**60**	**100**	**2**
E.	**Humanities and Social Sciences including Management courses**							
	NIL							
F.	**Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship in Industry or Elsewhere**							
	NIL							
G.	**Discipline, VAC & Social Outreach**							
BTXCTX2601	Talent Enrichment Programme (TEP)	**-**	**-**	**-**	**50**	**-**	**50**	**1**
	Library / MOOC / Online Certification Courses	**2**	**-**	**-**				
	Non-Syllabus Project / Industrial Visit / CRT	**2**	**-**	**-**				
	Total	**18**	**05**	**10**				
	Total Teaching Hours	**33**						**20**

POORNIMA UNIVERSITY								
Faculty of Engineering & Technology **Faculty of Computer Science and Engineering**								
Department of First Year								
Batch: 2022-26								
Name of Programs: B.Tech. (Computer Engineering)								
Teaching Scheme for Year I Semester II								
Course Code	**Course Name**	**Teaching Scheme (Hrs per Week)**			**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorials (T)**	**Practical (P)**	**IE**	**ESE**	**Total**	
A.	**University Core Courses**							
	NIL							
B.	**Department Core Courses**							
B.1	**Theory**							
BTXCSA2101	Engineering Chemistry	**3**	**-**	**-**	**40**	**60**	**100**	**3**
BTXCSA2102 / BTXCSA2103	Engineering Mathematics / Engineering Physics	**3**	**1**	**-**	**40**	**60**	**100**	**3**
BTXCEE2104 / BTXCME2105	Electrical & Electronics Engineering / Engineering Mechanics	**3**	**1**	**-**	**40**	**60**	**100**	**3**
BTXCCE2106/ BTXCEE2107	Programming in C / Introduction to Futuristic Technologies	**3**	**-**	**-**	**40**	**60**	**100**	**3**
B.2	Practical							
BTXCSA2201	Engineering Chemistry Lab		**-**	**2**	**60**	**40**	**100**	**1**
BTXCME2202 / BTXCSA2203	Machine Drawing Lab / Engineering Physics Lab-1	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCEE2204 / BTXCME2205	Electrical &Electronics Engineering Lab / Workshop Practice	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCCE2206 / BTXCME2207	Programming in C Lab / Practical Geometry	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCHM2208/ BTXCHM2209	Foundation English / Language Lab	**-**	**-**	**2**	**60**	**40**	**100**	**1**
BCECCE2210	Introduction to Web Technology	**-**	**1**	**2**	**60**	**40**	**100**	**1**
C.	**Department Elective**							
	NIL							
D.	**Open Elective: Anyone**							
	As per Annexure-I	**2**	**-**	**-**	**40**	**60**	**100**	**2**
E.	**Humanities and Social Sciences including Management courses**							
	NIL							
F.	**Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship in Industry or Elsewhere**							
	NIL							
G.	**Discipline, VAC & Social Outreach**							
BTXCTX2601	Talent Enrichment Programme (TEP)	**-**	**-**	**-**	**50**	**-**	**50**	**1**
	Library / MOOC / Online Certification Courses	**-**	**-**	**-**				
	Non-Syllabus Project / Industrial Visit / CRT	**1**	**-**	**-**				
	Total	**15**	**06**	**12**				
	Total Teaching Hours	**33**						**21**

POORNIMA UNIVERSITY

Faculty of Engineering & Technology
Faculty of Computer Science and Engineering

Department of First Year

Batch: 2022-26

Name of Programs: B.Tech. Computer Engineering (AI&DS, CS, CC, and GT)

Teaching Scheme for Year I Semester I

Course Code	Course Name	Teaching Scheme (Hrs per Week)			Marks Distribution			Credits
		Lecture (L)	Tutorials (T)	Practical (P)	IE	ESE	Total	
A.	**University Core Courses**							
BULCSA1101	Environmental Studies	**2**	**-**	**-**	**40**	**60**	**100**	**2**
B.	**Department Core Courses**							
B.1	**Theory**							
BTXCSA1101 / BTXCSA1102	Engineering Mathematics / Engineering Physics	**3**	**1**	**-**	**40**	**60**	**100**	**3**
BTXCEE1103 / BTXCME1104	Electrical & Electronics Engineering / Engineering Mechanics	**3**	**1**	**-**	**40**	**60**	**100**	**3**
BTXCCE1105/ BTXCEE1106	Programming in C / Introduction to Futuristic Technologies	**3**	**-**	**-**	**40**	**60**	**100**	**3**
BADCCE1107 BCCCCE1107 BCSCCE1107 BGTCCE1107	Introduction to Artificial Intelligence* Introduction to Cloud Computing** Introduction to Cyber Security*** Introduction to Game Technology#	**3**	**-**	**-**	**40**	**60**	**100**	**3**
B.2	**Practical**							
BTXCME1201 / BTXCSA1202	Machine Drawing Lab / Engineering Physics Lab-1	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCEE1203 / BTXCME1204	Electrical &Electronics Engineering Lab / Workshop Practice	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCCE1205 / BTXCME1206	Programming in C Lab / Practical Geometry	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCHM1207/ BTXCHM1208	Foundation English / Language Lab	**-**	**-**	**2**	**60**	**40**	**100**	**1**
C.	**Department Elective**							
	NIL							
D.	**Open Elective**							
	NIL							
E.	**Humanities and Social Sciences including Management courses**							
	NIL							
F.	**Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship in Industry or Elsewhere**							
BTXCTX1301	Project	**-**	**-**	**4**	**60**	**40**	**100**	**2**
G.	**Discipline, VAC & Social Outreach**							
BTXCTX1601	Talent Enrichment Programme (TEP)	**-**	**-**	**-**	**50**	**-**	**50**	**1**
	Library / MOOC / Online Certification Courses	**1**	**-**	**-**				
	Non-Syllabus Project / Industrial Visit / CRT	**1**	**-**	**-**				
	Total	**15**	**05**	**13**				
	Total Teaching Hours	**33**						**21**

***Applicable to B.Tech (AI&DS) ** Applicable to B.Tech CE (Cloud Computing) *** Applicable to B.Tech CE (Cyber security)**
 # applicable to B.Tech CE(Game Technology)

POORNIMA UNIVERSITY								
Faculty of Engineering & Technology Faculty of Computer Science and Engineering								
Department of First Year								
Batch: 2022-26								
Name of Programs: B.Tech. Computer Engineering (AI&DS, CS, CC, and GT)								
Teaching Scheme for Year I Semester II								
Course Code	**Course Name**	**Teaching Scheme (Hrs per Week)**			**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorials (T)**	**Practical (P)**	**IE**	**ESE**	**Total**	
A.	**University Core Courses**							
	NIL							
B.	**Department Core Courses**							
B.1	**Theory**							
BTXCSA2101	Engineering Chemistry	**3**	**-**	**-**	**40**	**60**	**100**	**3**
BTXCSA2102 / BTXCSA2103	Engineering Mathematics / Engineering Physics	**3**	**1**	**-**	**40**	**60**	**100**	**3**
BTXCEE2104 / BTXCME2105	Electrical & Electronics Engineering / Engineering Mechanics	**3**	**1**	**-**	**40**	**60**	**100**	**3**
BTXCCE2106/ BTXCEE2107	Programming in C / Introduction to Futuristic Technologies	**3**	**-**	**-**	**40**	**60**	**100**	**3**
B.2	Practical							
BTXCSA2201	Engineering Chemistry Lab		**-**	**2**	**60**	**40**	**100**	**1**
BTXCME2202 / BTXCSA2203	Machine Drawing Lab / Engineering Physics Lab-1	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCEE2204 / BTXCME2205	Electrical &Electronics Engineering Lab / Workshop Practice	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCCE2206/ BTXCME2207	Programming in C Lab / Practical Geometry	**-**	**1**	**2**	**60**	**40**	**100**	**1**
BTXCHM2208/ BTXCHM2209	Foundation English / Language Lab	**-**	**-**	**2**	**60**	**40**	**100**	**1**
BADCCE2210/ BCSCCE2210/ BCCCCE2210/ BGTCCE2210	Programming in Python	**-**	**1**	**2**	**60**	**40**	**100**	**1**
C.	**Department Elective**							
	NIL							
D.	**Open Elective: Anyone**							
	As per Annexure-I	**2**	**-**	**-**	**40**	**60**	**100**	**2**
E.	**Humanities and Social Sciences including Management courses**							
	NIL							
F.	**Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship in Industry or Elsewhere**							
	NIL							
G.	**Discipline, Value Added Courses & Social Outreach**							
	Talent Enrichment Programme (TEP)-II	**-**	**-**	**-**				
	Library / MOOC / NSP	**1**	**-**	**-**				
	Total	**15**	**06**	**12**				
	Total Teaching Hours	**33**						**21**

POORNIMAUNIVERSITY,JAIPUR

Faculty of Engineering &Technology

B. Tech. (Electrical & Computer Engineering), Batch: 2022-26

Teaching Scheme for Second Year-Third Semester

Course Code	Course Name	Teaching Scheme (Hrs. per Week)			Marks Distribution			Credits
		Lecture (L)	Tutorials (T)	Practical(P)	IE	ESE	Total	
A.	**University Core Courses**							
BEECSA3101	Advanced Mathematics	3	1	0	40	60	100	3
B.	**Department Core Courses**							
B.1	**Theory**							
BERCEE3102	Electrical Machines	3	1	0	40	60	100	3
BERCEE3103	Electronic Measurement and Instrumentation	3	0	0	40	60	100	3
BERCCE3104	Computer Organization and Architecture	3	0	0	40	60	100	3
B.2	**Practical**							
BEECEE3201	Electrical Machine Lab	0	0	2	60	40	100	1
BERCCE3202	Data Structure Lab	0	0	2	60	40	100	1
BERCEE3203	Measurement and Instrumentation Lab	0	0	2	60	40	100	1
BERCEE3204	Introduction to MATLAB	0	0	2	60	40	100	1
C.	**Department Elective**							
BEREEE3111	Analog and Digital Circuits	3	1	0	40	60	100	3
BEREEE3112	Data Structure				40	60	100	
BEREEE3113	Renewable and Alternate Energy				40	60	100	
D.	**Open Elective**							
	As per Annexure-I	2	0	0	40	60	100	2
E.	**Humanities and Social Sciences including Management courses(HSSM) OR Ability Enhancement Compulsory Course(AECC)**							
BERCHM3209	Human Values & Professional Ethics	0	0	2	40	60	100	1
F.	**Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship**							
	NA							
G.	**Discipline, VAC & Social Outreach**							
BERCEE3601	Talent Enrichment Programme (TEP)	-	-	-	50	-	50	1
	Library / MOOC / Online Certification Courses	2	-	-				
	Non-Syllabus Project / Industrial Visit / CRT	1	-	-				
	Total	**20**	**3**	**10**				
	Total Teaching Hours	**33**						**23**

POORNIMA UNIVERSITY, JAIPUR

Faculty of Engineering & Technology

B. Tech. (Electrical Engineering), Batch: 2022-26

Teaching Scheme for Second Year - Fourth Semester

Course Code	Course Name	Teaching Scheme (Hrs. per Week)			Marks Distribution			Credits
		Lecture (L)	Tutorials(T)	Practical (P)	IE	ESE	Total	
A.	**University Core Courses**							
	Nil							
B.	**Department Core Courses**							
B.1	**Theory**							
BERCEE4101	Electrical Circuit and Analysis	3	1	0	40	60	100	3
BERCEE4102	Control Systems	3	1	0	40	60	100	3
BERCCE4103	Computer Networks	3	0	0	40	60	100	3
BERCEE4104	Electronic Device and Circuit	3	1	0	40	60	100	3
B.2	**Practical**							
BERCEE4201	Control and Automation Lab	0	0	2	60	40	100	1
BERCEE4202	OOPS LAB	0	0	2	60	40	100	1
BERCEE4203	Computer Networks Lab	0	0	2	60	40	100	1
BERCEE4204	Electronic Device and Circuits Lab	0	0	2	60	40	100	1
C.	**Department Elective**							
BERECE4111	Object Oriented Programming	3	0	-	40	60	100	3
BEREEE4112	Operating Systems				40	60	100	
BEREEE4113	Energy and Environment Management				40	60	100	
D.	**Open Elective**							
	As Per Annexure-I	2	0	0	40	60	100	2
E.	**Humanities and Social Sciences including Management courses(HSSM) OR Ability Enhancement Compulsory**							
BERCHM4209	Leadership & Management Skills	0	0	2	60	40	100	1
F.	**Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship**							
	NA							
G.	**Discipline, VAC & Social Outreach**							
BERCEE4601	Talent Enrichment Programme (TEP)	-	-	-	50	-	50	1
	Library / MOOC / Online Certification Courses	1	-	-				
	Non-Syllabus Project / Industrial Visit / CRT	2	-	-				
	Total	**20**	**3**	**10**				
	Total Teaching Hours	**33**						**22**

POORNIMA UNIVERSITY, JAIPUR

Faculty of Engineering & Technology

B. Tech. (Electrical & Computer Engineering), Batch: 2022-26

Teaching Scheme for Third Year - Fifth Semester

Course Code	Course Name	Teaching Scheme (Hrs. per Week)			Marks Distribution			Credits
		Lecture(L)	Tutorial (T)	Practical(P)	IE	ESE	Total	
A.	**University Core Courses**							
	Nil							
B.	**Department Core Courses**							
B.1	**Theory**							
BERCEE5101	Electrical Power Generation, Transmission and Distribution	3	0	0	40	60	100	3
BERCEE5102	Microprocessor and Microcontrollers	3	0	0	40	60	100	3
BERCEE5103	Power Electronics and Drives	3	0	0	40	60	100	3
BERCEE5104	Artificial Intelligence & Expert System	3	0	0	40	60	100	3
BERCEE5105	Electric Vehicle Technology	3	0	0	40	60	100	3
B.2	**Practical**							
BERCEE5201	Microprocessor and Microcontroller Lab	0	0	2	60	40	100	1
BERCEE5202	Power Electronics and Drives Lab	0	0	2	60	40	100	1
BERCEE5203	switchgear & Protection Lab	0	0	2	60	40	100	1
C.	**Department Elective**							
BEREEE5111	Solar Thermal and PV	3	0	0	40	60	100	3
BEREEE5112	Hydrogen Energy and Fuel Cells				40	60	100	
BEREEE5113	Switchgear and Protection of Power System				40	60	100	
D.	**Open Elective**							
	As Per Annexure-I	2	0	0	40	60	100	2
E.	**Humanities and Social Sciences including Management courses(HSSM) OR Ability Enhancement Compulsory**							
BERCHM5209	Professional Skills-I	0	0	2	60	40	100	1
BERCHM5210	Communication Skills-I	0	0	2	60	40	100	1
F.	Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship							
BERCEE5401	Technical Seminar	-	-	2	60	40	100	1
G.	**Discipline, VAC & Social Outreach**							
BERCEE5601	Talent Enrichment Programme (TEP)	-	-	-	50	-	50	1
	Library / MOOC / Online Certification Courses	-	-	-				
	Non-Syllabus Project / Industrial Visit / CRT	1	-	-				
	Total	**21**	**0**	**12**				
	Total Teaching Hours	**33**						**27**

POORNIMA UNIVERSITY, JAIPUR

Faculty of Engineering & Technology

B. Tech. (Electrical & Computer Engineering), Batch: 2022-26

Teaching Scheme for Third Year - Sixth Semester

Course Code	Course Name	Teaching Scheme(Hrs. per Week)			Marks Distribution			Credits
		Lecture (L)	Tutorial(T)	Practical (P)	IE	ESE	Total	
A.	**University Core Courses**							
	NIL							
B.	**Department Core Courses**							
B.1	**Theory**							
	Nil							
B.2	**Practical**							
	Nil							
C.	**Department Elective**							
	Nil							
D.	**Open Elective**							
	Nil							
E.	**Humanities and Social Sciences including Management courses (HSSM) OR Ability Enhancement Compulsory**							
	Nil							
F.	**Skill Enhancement Courses(SEC)OR Project work, Seminar and Internship**							
BERCEE6301	Minor Project	-	-	2	60	40	100	1
BERCEE6302	Industrial Training Seminar	-	-	2	60	40	100	6
G.	**Discipline, VAC & Social Outreach**							
BERCEE6601	Talent Enrichment Programme (TEP)	-	-	-	50	-	50	1
	Library / MOOC / Online Certification	1	-	-				
	Non-Syllabus Project / Industrial Visit / CRT	-	-	-				
	Total	**1**	**-**	**4**				
	Total Teaching Hours	**5**						**8**

Note: all students are required to go to internship for 6 months.

POORNIMA UNIVERSITY, JAIPUR

Faculty of Engineering & Technology

B. Tech. (Electrical & Computer Engineering), Batch: 2022-26

Teaching Scheme for Fourth Year - Seventh Semester

Course Code	Course Name	Teaching Scheme (Hrs. per Week)			Marks Distribution			Credits
		Lecture (L)	Tutorials (T)	Practical (P)	IE	ESE	Total	
A.	**University Core Courses**							
	NIL							
B.	**Department Core Courses**							
B.1	**Theory**							
BERCEE7101	Theory and Practical Aspect of Machine Learning	3	-	-	40	60	100	3
BERCEE7102	Power System	3	-	-	40	60	100	3
BERCCE7103	Computational theory and Compiler Design	3	-	-	40	60	100	3
BERCEE7104	FACTS Devices & Their Application	3	-	-	40	60	100	3
BERCEE7105	Data Base management System	3	-	-	40	60	100	3
B.2	**Practical**							
BERCEE7201	Power System Lab	-	-	2	60	40	100	1
BERCCE7202	Natural Language processing Lab	-	-	2	60	40	100	1
BERCCE7203	DBMS Lab	-	-	2	60	40	100	1
C.	**Department Elective**							
BEREEE7111	Solar Thermal Engineering Processes	3	-	-	40	60	100	3
BEREEE7112	EHV AC/DC Transmission System				40	60	100	
BEREEE7113	Electronics Circuits for Renewable Energy Systems				40	60	100	
D.	**Open Elective**							
	As Per Annexure-I	2						2
E.	**Humanities and Social Sciences including Management courses(HSSM) OR Ability Enhancement Compulsory**							
BXXCHM7209	Professional Skills-II	-	-	2	60	40	100	1
F.	**Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship**							
BXXCHM7210	Use of Social Media	-	-	2	60	40	100	1
G.	**Discipline, VAC & Social Outreach**							
BERCEE7601	Talent Enrichment Programme (TEP)	0	-	-	50	-	50	1
	Library / MOOC / Online Certification Courses	1	-	-				
	Non-Syllabus Project / Industrial Visit / CRT	2	-	-				
	Total	**23**	**-**	**10**				
	Total Teaching Hours	**33**						**26**

POORNIMA UNIVERSITY, JAIPUR

Faculty of Engineering & Technology

B.Tech.(Electrical & Computer Engineering),Batch:2022-26

Teaching Scheme for Fourth Year - Eighth Semester

Course Code	Course Name	Teaching Scheme (Hrs. per Week)			Marks Distribution			Credits
		Lecture(L)	Tutorials(T)	Practical (P)	IE	ESE	Total	
A.	**University Core Courses**							
	NIL							
B.	**Department Core Courses**							
B.1	**Theory**							
BERCEE8101	Power System Restructuring and Smart Grid	3	1	0	40	60	100	3
BERCEE8102	Digital Image Processing	3	0	0	40	60	100	3
B.2	**Practical**							
BERCEE8201	Energy System Lab	0	0	2	60	40	100	1
BERCEE8202	Digital Image Processing Lab	0	0	2	60	40	100	1
C.	**Department Elective**							
BEREEE8111	Optimization Theory	3	0	0	40	60	100	3
BEREEE8112	Power System operation and control							
D.	**Open Elective**							
	nil							
D.	**Humanities and Social Sciences including Management courses(HSSM) OR Ability Enhancement Compulsory Course(AECC)**							
BERCHM8209	Communication Skills-II	0	0	2	60	40	100	1
E.	**Skill Enhancement Courses (SEC) OR Project work, Seminar and Internship**							
BERCEE8301	Major Project / Dissertation	-	-	16	60	40	100	8
F.	**Discipline, VAC & Social Outreach**							
BERCEE8601	Talent Enrichment Programme (TEP)	-	-	-	50	-	50	1
	Library / MOOC / Online Certification Courses	2	-	-				
	Non-Syllabus Project / Industrial Visit / CRT	-	-	-				
	Total	**11**	**0**	**22**				**21**
	Total Teaching Hours	**33**						

Code: BULCSA1101	Environmental Studies	2 Credits [LTP: 2-0-0]

COURSE OUTCOME: Students will be able:

CO1: To analyze the scope of environmental studies and explain the concept of ecology, ecosystem and biodiversity.
CO2: To implement innovative ideas of controlling different categories of Environmental Pollution.
CO3: To explain different environmental issues together with various Environmental Acts, regulations and International Agreements.
CO4: To summarize social issues related to population, resettlement and rehabilitation of project affected persons and demonstrate disaster management with special reference to floods, earthquakes, cyclones, landslides.
CO5 : To determine the local environmental assets with simple ecosystems and identify local flora and fauna.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to environmental studies	**5**
2.	Environmental Pollution and its control	**5**
3.	Environmental Policies & Practices	**5**
4.	Human Communities and the Environment	**5**
5.	Field work	**4**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to environmental studies**
	• Introduction of Unit • Multidisciplinary nature of environmental studies • Concept of sustainability and sustainable development. • Ecosystem: Structure and function of ecosystem • Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies\ • Case studies of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem Aquatic ecosystems, Biodiversity and Conservation • Conclusion of Unit including Real Life Application
2.	**Environmental Pollution and its control**
	• Introduction of Unit • Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution • Nuclear hazards and human health risks • Solid waste management: Control measures of urban and industrial waste.

	• Pollution case studies • Conclusion of Unit including Real Life Application
3.	**Environmental Policies & Practices**
	• Introduction of Unit • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. • International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD) • Conclusion of Unit including Real Life Application
4.	**Human Communities and the Environment**
	• Introduction of Unit • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management: floods, earthquake, cyclones and landslides. • Conclusion of Unit including Real Life Application
5.	**Field work**
	• Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. • Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. • Study of common plants, insects, birds and basic principles of identification. • Study of simple ecosystems-pond, river, Delhi Ridge, etc.

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Environmental Studies	Erach Barucha	Latest	UGC
2	Environmental Studies	Benny Joseph	Latest	Tata McgrawHill
3	Environmental Studies	R. Rajagopalan	Latest	Oxford University Press
4	Principles of Environmental Science and Engineering	P. Venugoplan Rao	Latest	Prentice Hall of India.
Important Web Links				
1	http://www.energy.gov			
2	https://nptel.ac.in/courses/122102006/			

Code: BTXCSA1101 ENGINEERING MATHEMATICS 3 Credits [LTP: 3-1-0]

COURSE OUTCOME: The student would be able:

CO1: To analyze and prove relationships between matrices, rank of matrix and systems of equations, Inverses.
CO2 : To analyze the basic structure of differential equations, and order and degree of the first order and first degree and its simple applications
CO3: To utilize methods of integration to evaluate volumes and surface of objects and lengths of curves.
CO4 : To apply vector differentiation, and integration in the scalar and vector fields
CO5 : To apply line, surface and volume integral with the help of green's theorem, Gauss's theorem and Stokes theorem.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	Matrices	7
2	Integral Calculus	8
3	Ordinary Differential Equations	6
4	Introduction Vector Calculus	7
5	Application of Vector Calculus	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Matrices**
	• Introduction of Unit • Rank of a Matrix, Normal form of a Matrix • Consistency of systems of linear equations • Eigen Values and Eigen Vectors • Cayley-Hamilton Theorem (without proof) • Conclusion of Unit
2.	**Ordinary Differential Equations**
	• Introduction of Unit • First order and first-degree differential equations-Separable Variables, • Linear Equation and reducible to linear form, Exact Equation • Linear differential equations with constant coefficients • Conclusion of Unit
3.	**Integral Calculus**
	• Introduction of Unit • Beta and Gamma functions and their properties • Surfaces and Volumes of Solids of Revolutions • Double integrals, Double integral by changing into polar form, Areas by Double Integration

	• Change of order of integration • Conclusion of Unit
4.	**Vector Calculus**
	• Introduction of Unit • Scalar and Vector field • Differentiation and Integration of Vector functions • Gradient, Divergence and Curl, Directional derivatives • Conclusion of Unit
5.	**Application of Vector Calculus**
	• Introduction of Unit • Line, Surface and Volume integral • Gauss, Stocks and Green theorem (without proof) and its applications • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Higher Engineering Mathematics	B S Grewal	Latest	Khanna Publications, Delhi,
2.	Higher Engineering Mathematics	Ramana, B.V	Latest	Tata McGraw-Hill.
3	Engineering Mathematics: A Tutorial Approach	Ravish R Singh and M Bhatt	Latest	Tata McGraw-Hill
4	Calculus and Analytical Geometry	Thomas and Finney,	Latest	Narosa Publishing, New Delhi
5	Advanced Engineering Mathematics	Erwin Kreyszig	Latest	John Wiley and Sons
Important Web Links:				
1	https://nptel.ac.in/courses/111105134/			
2	https://nptel.ac.in/courses/122/101/122101001/			
3	https://www.classcentral.com/course/swayam-engineering-mathematics-i-13000			

Code: BTXCSA1102	ENGINEERING PHYSICS	3 Credits [LTP: 3-1-0]

COURSE OUTCOME: The student will be able to:
CO1: Produce coherent sources and phenomenon of interference and diffraction
CO2: Compare quantum mechanical history with experimental facts and its applications.
CO3: Debates in laser and fibre optics and apply it for suitable applications.
CO4 : Point out the basic principles of relativity, twin paradox and energy-mass relations.
CO5 : Categorize different bonding in materials, band theory and semiconductor material.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Wave Optics	8
2	Quantum Mechanics	7
3	Laser & Optical Fibre	6
4	Special Theory of Relativity	6
5	Elements of Material Science	6

B. DETAILED SYLLABUS

Unit No.	Unit Details
1.	**Wave Optics**
	• **Introduction of Unit** • **Interference of light:** Types of interference, • Coherent source, methods to produce coherent sources with examples. • Newton's Rings: Principle, Construction, working &Applications • **Diffraction of light:** Fraunhofer Diffraction from a Single Slit • **Diffraction grating:** Introduction and its construction • Resolving power and Rayleigh criterion for limit of resolution • Conclusion of Unit
2.	**Quantum Mechanics**
	• Introduction of Unit • Black body radiation and Planck's hypothesis • Compton Effect, Compton shift • Wave function and its basic postulates • Physical interpretation of wave function and its properties • Time dependent and time independent Schrodinger's Wave Equation, • Applications of the Schrodinger's Equation: Particle in one dimensional box • Conclusion of Unit
3.	**Laser & Optical Fiber**

	• Introduction of Unit • Theory of laser action: Einstein's Coefficients, Components of laser, Threshold conditions for laser action • Theory, Design and Applications of He-Ne Laser • Optical Fiber: Construction and working principle of Optical fiber • Types of optical fibre (on the basis of modes and the refractive index of the medium) • Applications of optical fibre • Conclusion of Unit
4.	**Special Theory of Relativity**
	• Introduction of Unit • Inertial and non-inertial frames of Reference. • Postulates of special theory relativity • Galilean and Lorentz Transformations, Length contraction, Mass Variation and Time Dilation. • Relativistic Mass-Energy relation • Relativistic Energy and Momentum • Conclusion of Unit
5	**Elements of Material Science**
	• Introduction of Unit: Bonding in solids, Covalent bonding and Metallic bonding • Classification of Solids as Insulator, Semi-Conductor and Conductor • Semiconductors: Conductivity in Semiconductors • Determination of band gap of a semiconductor • Hall Effect: Theory, Hall Coefficients and application to determine the sign of charge carrier • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Books	Author	Edition	Publication
1.	Fundamental of Optics	Jenkins and While	4th	Tata McGraw-Hill
2.	Optics	Ajoy Ghatak	3rd	Tata McGraw-Hill
3.	A Text Book of optics	Brijlal& Subramanium	Latest	S.Chand and co. Ltd
4.	Quantum Mechanics	Schiff	3rd	Tata Mc Graw-Hill
5.	Concept of Modern Physics	Beiser	Latest	Tata McGraw-Hill
6.	Introduction to special Theory of Relativity	R. Resnick	Latest	Johan Willy Singapore
7.	Elements of Properties of Matter	D.S.Mathur	Latest	S.Chand& Co.
8.	Solid State Physics	S.O.Pillai	Latest	Wiley Eastern Ltd.
Important Web Links				
1.	https://nptel.ac.in/courses/122107035/			
2.	https://nptel.ac.in/courses/122103011/			
3.	https://www.khanacademy.org/science/physics			
4.	https://ocw.mit.edu/courses/physics/			

Code:BTXCEE1103 ELECTRICAL & ELECTRONICS ENGINEERING 3Credits[LTP: 3-1-0]

COURSE OUTCOME: The student will be able to:

CO1: Apply basic electrical concepts, including various circuit analysis techniques and fundamentals of theorem, in practical applications.
CO2: Analyze the fundamentals of AC circuits such as the R.M.S value, average value, active power, reactive power, power factor, form factor, peak factor and their applications.
CO3: Analyze the energy conversion process and fundamentals of rotating and stationary electrical machines with their application in real life.
CO4: Analyze the working of semiconductor devices such as Diode, BJT, UJT, photovoltaic cells, filters and fundamentals of digital electronics.
CO5: Illustrate the concepts of Communication systems and Instrumentation engineering in practical applications.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Basic Concepts of Electrical Engineering	7
2.	Alternating Quantities and Electrical Installations	8
3.	Energy Conversion and Electrical Machines	7
4.	Basic Electronics	7
5.	Communication Systems and IoT	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Basic Concepts of Electrical Engineering**
	• Introduction of Unit • Basic Concepts: Electric Current, Electromotive Force, Electric Power, Ohm's Law, Basic Circuit Components, Faraday's Law of Electromagnetic Induction. • DC Network Analysis & Theorems: Kirchhoff's Laws, Network Sources, Resistive Networks, Series-Parallel Circuits, Star-Delta Transformation, Node Voltage Method, Mesh Current Method, Super- Position, Thevenin's, Norton's and Maximum Power Transfer Theorems. • Conclusion of Unit
2.	**Alternating Quantities and Electrical Installations**
	• Introduction of Unit • Single Phase AC system: Introduction, Generation of AC Voltages, Root Mean Square and Average Value of Alternating Currents and Voltages, Form Factor, Peak Factor, Power Factor and Quality Factor, Phasor Diagram • Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries. Elementary calculations for energy consumption and savings, battery backup. • Conclusion of Unit
3.	**Energy Conversion and Electrical Machines**

	• Introduction of Unit • Introduction to Energy: Types of Energy, Introduction to Energy Conversion, Sources of Energy (Conventional & Non-Conventional), Energy Scenario in India & Rajasthan. • Rotating Machines: **DC Machines**: Principle of Operation of DC Machine as Motor and Generator, EMF Equation, Applications of DC Machines. **AC Machines:** Principle of Operation of 3-Phase Induction Motor, 3-Phase Synchronous Motor and 3- Phase Synchronous Generator (Alternator), Applications of AC Machines. **Electric Vehicle:** Introduction to Electric Vehicles: Types of EVs, Applications of EV, Charging of EV. Stationary Machines: Introduction, Construction and Principle of Working of Transformer, EMF Equation, • Conclusion of Unit
4.	**Basic Electronics**
	• Introduction of Unit • **Semiconductor Devices:** Conduction in Semiconductors, Conduction Properties of Semiconductor Diodes, Behavior of the PN Junction, PN Junction Diode, Zener Diode, LED, Photovoltaic Cell, Rectifiers, L, C, & L-C filters ,BJT, UJT, Transistor as an Amplifier. • **Digital Electronics:** Boolean algebra, Binary System, Logic Gates and Their Truth Tables. • Conclusion of Unit
5.	**Communication Systems and IoT**
	• Introduction of Unit • **Basics of Communication: I**ntroduction, IEEE Spectrum for Communication Systems, Types of Communication, Amplitude and Frequency Modulation. • **Basics of Instrumentation:** Introduction to Transducers, Thermo couple, RTD, Strain Gauges, Load Cell and Bimetallic Strip. • **An overview of Internet of Things-**Building blocks of IoT, IoT enabling technologies, Characteristics of IoT systems and IoT levels, Evolution of the Internet paradigm, Device-to-Device/ Machine-to-Machine Integration • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

Sr. No	Reference Book	Author	Edition	Publication
1	Electrical and Electronic Technology	Edward Hughes et al,	Latest	Pearson Publication
2	Basic Electrical & Electronics Engineering	V. Jagathesan, K. Vinod Kumar & R. Saravan Kumar	Latest	Wiley India
3	Basic Electrical & Electronics Engineering	Van Valken burge	Latest	Cengage learning
4	Basic Electrical and Electronics Engineering by,	Muthusubrmaniam	Latest	TMH
5	Basic Electrical & Electronics Engineering	Ravish Singh	Latest	TMH
Important Web Links				
1.	https://nptel.ac.in/courses/108108076/			
2.	https://nptel.ac.in/courses/117103063/			

Code: BTXCME1104	ENGINEERING MECHANICS	3 Credits [LTP: 3-1-0]

COURSE OUTCOME: The student would be able to:

CO1: Analyze the forces act on a component and method of resolution.

CO2: Evaluate the centroid and center of gravity of an object and also analyze how to minimize the effort for lifting a load.

CO3: Evaluate the effect of friction and also evaluate forces with the effect of friction.

CO4: Analyze the conversion of linear motion into angular motion and vice versa.

CO5: Analyze the effect of impact on elastic and non-elastic body.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Fundamentals of Mechanics	**7**
2.	Machine & Moment of Inertia	**8**
3.	Friction & Belt Drive	**7**
4.	Dynamics of Particles	**7**
5.	Work, Power & Impact	**7**

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Fundamentals of Mechanics**
	• Introduction of Unit • Fundamental laws of mechanics, Principle of transmissibility. • System of forces, Resultant force, Resolution of force. • Moment and Couples, Varignon's Theorem, • Equilibrium, Conditions for equilibrium, Lami's theorem. • Conclusion of Unit
2.	**Machine & Moment of Inertia**
	• Introduction of Unit • **Lifting Machines**: Mechanical advantage, Velocity Ratio, Efficiency of machine, Ideal machine, Ideal effort and ideal load, Reversibility of machine, Law of machine, Lifting machines. • **Centroid & Moment of Inertia:** Location of centroid and center of gravity, Moment of inertia, Parallel axis and perpendicular axis theorem, Radius of gyration, M.I of composite section. • Conclusion of Unit
3.	**Friction & Belt Drive**
	• Introduction of Unit • **Friction**: Types of Friction, Laws of friction, Angle of friction, Angle of repose, Ladder.

	• **Belt Drive**: Types of belts, Types of belt drives, Velocity ratio, Effect of slip on Velocity ratio, Length of belt, Ratio of tensions and power transmission by flat belt drives. • Conclusion of Unit
4.	**Dynamics of Particles**
	• Introduction of Unit • **Kinematics of Particles and Rigid Bodies**: Velocity, Acceleration, Types of Motion, Equations of Motion, Rectangular components of velocity and acceleration, Angular velocity and Angular acceleration. • **Kinetics of Particles and Rigid Bodies**: Newton's laws, Linear Momentum, Equation of motion in rectangular coordinate, Equation of motion in plane for a rigid body, D'Alembert principle. • Conclusion of Unit
5.	**Work, Power & Impact**
	• Introduction of Unit • **Work, Energy and Power**: Work of a force, weight, Power, Efficiency, Energy, Kinetic energy of rigid body, Principle of work and energy. • **Impact**: Collision of elastic bodies, types of impact, conservation of momentum, Newton's law of collision. • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1.	Vector Mechanics for Engineers	Beer and Johnston	Latest	Tata McGraw Hill
2.	Engineering Mechanics	D S Kumar	Latest	S K Kataria& Sons
3.	Engineering Mechanics Statics	Meriam, J. L. & Kraige, L. G	Latest	John Wiley & Son
4.	Engineering Mechanics	S. Ramamruthan	Latest	Dhanpat Rai Pub.
5.	Engineering Mechanics	Shames	Latest	Pearson Education
Important Web Links				
1.	https://nptel.ac.in/courses/112103109/			
2.	https://nptel.ac.in/courses/112106286/			
3.	https://freevideolectures.com/course/2264/engineering-mechanics			

Code: BTXCCE1105	Programming in C	3 Credits [LTP:3-0-0]

COURSE OUTCOMES: - On completion of the course, students will be able:

CO1: To identify parts of computer hardware

CO2: To evaluate data representation techniques like binary, hexadecimal and octal

CO3: To design algorithms to solve small computer problems related to daily life

CO4: To apply arithmetic operations and sequential programming using C Language

CO5: To discriminate among while, for and do-while iterative statements

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to C	5
2.	Data Representation and Looping Statement	5
3.	Functions	5
4.	Memory Allocation	10
5.	Concept of I/O File Allocation	11

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to C**
	• Introduction to the C Language – Algorithm, Pseudo code, • Flow chart, Background, C Programs, Identifiers, • Data Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise etc.), • Expressions, Precedence and Associatively, Expression Evaluation, Type conversions.
2.	**Data Representation and Looping Statement**
	• Statements- Selection Statements (making decisions) – if and switch statements, • Repetition statements (loops)-while, for, do-while statements, • other statements related to looping – break, continue, go to
3.	**Functions**
	• Functions- Introduction to Structured Programming, • Functions- basics, user defined functions, inter function communication (call by value, call by reference), • Standard functions. Storage classes-auto, register, static, extern, • scope rules, arrays to functions, recursive functions,
4.	**Memory Allocation**
	• Arrays– Basic concepts, one-dimensional arrays, two – dimensional arrays, multidimensional arrays, • Pointers – Introduction (Basic Concepts), pointers to pointers, compatibility, Pointer Applications, Arrays and Pointers, Pointer Arithmetic,

	• Memory allocation functions, array of pointers, pointers to void • pointers to functions, command –line arguments, Introduction to structures and unions.
5.	**Concept of I/O File Allocation**
	• Strings – Concepts, C Strings, String Input / Output functions, string manipulation functions, • string /data conversion. Input and Output – Concept of a file, streams, text files and binary files, • Differences between text and binary files, State of a file, • Opening and Closing files, file input / output functions (standard library input / output functions for files), • file status functions (error handling),Positioning functions.

C. RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1.	Fundamentals of Computers	V.Rajaraman	Sixth	PHI
2.	Computer Fundamentals and Programming in C	Reema Thareja	Second	Oxford
3.	Fundamentals of Computers	E Balagurusamy	First	Tata McGraw Hill
4.	Programming in ANSI C	E Balagurusamy	Eight	Tata McGraw Hill
5.	Let US C	Yashavant Kanetkar	Fifteenth	BPB Publications
6.	The C Programming language	Ritchie Kernighan	Third	PHI
Important Web Links				
1.	https://www.learn-c.org/			
2.	https://www.sanfoundry.com/			
3.	https://nptel.ac.in/courses/106/104/106104128/			
4.	http://www.tutorials4u.com/c/			
5.	www.howstuffworks.com/c.htm			

Code: BTXCME1106 INTRODUCTION TO FUTURISTIC TECHNOLOGIES 3 Credit [LTP: 3-0-0]

COURSE OUTCOME: The student would be able to:

CO1 analyze the design and working of Hybrid and Electric Vehicle.

CO2 analyze the need of Additive Manufacturing (AM) and Rapid Prototyping (RP).

CO3 create smart devices using Internet of Things (IoT).

CO4 analyze the future with AI, and AI in Action

CO5 analyze the Opportunities and Challenges in adoption of Industry 4.0.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time Required for the Unit (Hours)
1.	Introduction to Hybrid and Electric Vehicle	8
2.	Introduction to Additive Manufacturing (AM) and Rapid Prototyping (RP)	7
3.	Introduction to Internet of Things (IoT)	7
4.	Introduction to Artificial Intelligence (AI) and Blockchain	7
5.	Introduction to Industry 4.0 and 5.0	7

B. DETAILED SYLLABUS

Unit	Contents
1.	**Introduction to Hybrid and Electric Vehicle**
	• Introduction of Unit • Hybrid and Electric Vehicles (HEV): History Overview and Modern Applications • Power Flow and Power Management in HEV • Introduction to Electric Drives: Shunt Drives, Series Drives, Compound Drives • Types of Batteries and Energy Storages • Introduction to Power Electronics in Hybrid Electric Vehicles • Case Studies: Toyota Camry Hybrid, MG Hector Hybrid, Tata Nexon EV • Conclusion of Unit
2.	**Introduction to Additive Manufacturing (AM) and Rapid Prototyping (RP)**
	• Introduction of Unit • Introduction to reverse engineering Traditional manufacturing v/s AM • Computer aided design (CAD) and manufacturing (CAM) and AM • Different AM processes and relevant process physics AM process chain • Growth of RP industry, and classification of RP systems • Application level: Stereo Lithography Systems, Selective Laser Sintering Fusion, Deposition Modelling, Solid Ground Curing, 3-D Printing processes • Conclusion of Unit
3.	**Introduction to Internet of Things (IoT)**

	• Introduction of Unit • Introduction to IoT • Sensing, Actuation, Basics of Networking • Interoperability in IoT, • Introduction to Arduino Programming: Sensors and Actuators with Arduino • Introduction to Raspberry Pi, Implementation of IoT with Raspberry Pi • Case Studies: Smart Cities and Smart Homes, Connected Vehicles, Healthcare, • Conclusion of Unit
4.	**Introduction to Artificial Intelligence (AI) and Blockchain**
	• Introduction of Unit • What is AI? Applications and Examples of AI • AI Concepts, Terminology, and Application Areas • AI: Issues, Concerns and Ethical Considerations • The Future with AI, and AI in Action • Case Studies: Travel & Navigation, Social Media Feeds, Google Lens and OCR, Smart Cars, Security & surveillance • Introduction to Block chain Technology • Conclusion of Unit
5.	**Introduction to Industry 4.0 and 5.0**
	• Introduction of Unit • Introduction to Industry 4.0 • Road to Industry 4.0: Smart Manufacturing, Smart Devices and Products, Smart Logistics, Smart Cities, Predictive Analytics • Technologies for enabling Industry 4.0, Opportunities and Challenges • Future of Works and Skills for Workers in the Industry 4.0 Era, Industry 4.0 vs Industry 5.0 • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Electric and Hybrid Vehicles	A.K. Babu	Second Edition, 2022	Khanna Publishing
2	Artificial Intelligence: Concepts and Applications	Lavika Goel	2021	Wiley
3	Industry 4.0: Challenges, Trends, and Solutions in Management and Engineering	Carolina Machado	2021	CRC Press
4	Additive Manufacturing	C. P. Paul	2021	McGraw Hill
Important Web Links				
1	https://nptel.ac.in/courses/106105195			
2	https://www.linkedin.com/learning/foundations-of-the-fourth-industrial-revolution-industry-4-0			
3	https://nptel.ac.in/courses/108103009			
4	https://onlinecourses.nptel.ac.in/noc22_cs56/preview			

Code: BTXCCE1107	Fundamental of Computing	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

The students will be able to:

- Compare and contrast various types of computers and converse in basic computer terminology
- Explain the purpose of ALU, CPU and possess the knowledge of basic hardware peripherals
- Describe how information is stored in memory
- Know and use different number systems and the basics of programming
- Work on various types of operating system using networking concepts

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Computer**	07
2.	**Computer Memory and Language**	08
3.	**Structure of Computer and Input/ Output Devices**	08
4.	**Number System and Computer Codes**	07
5.	**Operating System and Networking**	07

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Computer**
	• Introduction to Computer • Computer Characteristics • Concept of Hardware, Software • Evolution of computer and Generations • Types of Computer – Analog and Digital computers • Hybrid Computers, General Purpose and Special Purpose Computer • Limitations of Computer Applications of Computer in Various Fields • Conclusion of Unit
2.	**Structure of Computer and Input/ Output Devices**
	• Introduction to Structure of Computer • Functional Block Diagram of Computer. CPU, ALU, Memory Unit, Bus Structure of Digital Computer – Address, Data and Control Bus. • Input Device – Keyboard, Mouse, Scanner, MICR, OMR. Output Devices – VDU, Printers – Dot Matrix, Daisy-wheel, Inkjet, Laser, Line Printers and Plotters. • Conclusion of Unit
3.	**Computer Memory and Language**
	• Introduction to Computer Memory • Memory Concept, Memory Hierarchy, Processor, Registers, Cache memory, primary

	memory, secondary storage devices, magnetic tapes, floppy disks, hard disks, optical drives, USB flash drivers, Memory cards, Mass storage devices • Semiconductor Memory – RAM, ROM, PROM, EPROM • Algorithm, Flowcharts, Machine Language, Assembly Language, High Level Language, Assembler, Compiler, Interpreter • Characteristics of Good Language. Software – System and Application Software. • Conclusion of Unit
4.	**Number System and Computer Codes**
	• Introduction to Number System • Binary number system, working with binary numbers • Octal number system, hexadecimal number system and their conversions • Binary addition and subtraction • Working with fractions, signed number • Representation in binary form, BCD code, and other codes. • Conclusion of Unit
5.	**Operating System and Networking**
	• Introduction to Operating System • Evolution of Operating System. Functions of Operating System. • Types of Operating Systems. Detailed Study of Windows Operating System. • Introduction and Features of LINUX OS. • Concept, Basic Elements of a Communication System, Data Transmission Media, Topologies, LAN, MAN, WAN, Internet • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Fundamentals of Computers	V.Rajaraman, NeeharikaAdabala	6th Edition	PHI Learning
2.	Computer Fundamentals	Anita Goel,	1st Edition	Pearson
Reference Book				
3.	Computer Fundamentals : Concepts, Systems & Applications, Priti Sinha, Pradeep K., Sinha , BPB Publications			
Online Resources				
4.	https://www.tutorialspoint.com/basics_of_computers/index.htm			
5.	https://www.youtube.com/watch?v=eEo_aacpwCw			

Code: BADCCE1107	Introduction to Artificial Intelligence	3 Credit [LTP: 3-0-0]

COURSE OUTCOMES: The student would be able to:

CO1: Apply the basic principles, models, and algorithms of **AI** to recognize, model, and solve problems in the analysis and design of information systems.
CO2: Analyze the structures and algorithms of a selection of techniques related to searching, reasoning, **machine learning**, and language processing.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Introduction to AI	10
2	Problem-solving	10
3	Knowledge and reasoning	9
4	Acting logically	9
5	Generalized Models	10

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to AI**
	• Introduction to the unit • What is AI? , Thinking humanly, Acting rationally, The Foundations of Artificial Intelligence, The History of Artificial Intelligence. • The gestation of artificial intelligence, AI becomes an industry, Knowledge-based systems, The return of neural networks, The State of the Art. • Intelligent Agents, How Agents Should Act, Structure of Intelligent Agents, Simple reflex agents, Goal-based agents, Utility-based agents. • Environments, Environment programs. • Conclusion unit
2.	**Problem-solving**
	• Introduction to the unit • Solving Problems by Searching, Problem-Solving Agents. • Formulating Problems, Well-defined problems and solutions, Measuring problem-solving performance. • Toy problems, searching for Solutions, Search Strategies, Avoiding Repeated States, Constraint Satisfaction Search. • Informed Search Methods, Best-First Search, Heuristic Functions. • Memory Bounded Search, Iterative Improvement Algorithms. • Applications in constraint satisfaction problems. • Conclusion unit
3.	**Knowledge and reasoning**
	• Introduction to the unit • A Knowledge-Based Agent, Representation, Reasoning, and Logic, Prepositional Logic.

	• An Agent for the Wumpus World, Problems with the propositional agent, First-Order Logic, Syntax and Semantics, Extensions and Notational Variations, Using First-Order Logic. • A Simple Reflex Agent, Deducing Hidden Properties of the World, Toward a Goal-Based Agent, Building a Knowledge Base. • Knowledge Engineering, Inference Rules Involving Quantifiers, Generalized Modus Ponens. • Forward and Backward Chaining, Completeness, Resolution: A Complete Inference Procedure, Completeness of resolution • Conclusion unit
4.	**Acting logically**
	• Introduction to the unit • A Simple Planning Agent, From Problem Solving to Planning, Planning in Situation Calculus. • Basic Representations for Planning, A Partial-Order Planning Algorithm, Planning with Partially Instantiated Operators, Knowledge Engineering for Planning, Practical Planners. • Hierarchical Decomposition, Analysis of Hierarchical Decomposition. • More Expressive Operator Descriptions, Resource Constraints, Planning and Acting. • Conditional Planning, A Simple Re-planning Agent, Fully Integrated Planning and Execution • Conclusion unit
5.	**Generalized Models**
	• Introduction to the unit • A General Model of Learning Agents, Components of the performance element. • Representation of the components, Inductive Learning, Learning Decision Trees, Using Information Theory, Learning General Logical Descriptions, Computational Learning Theory. • Learning in Neural and Belief Networks, Neural Networks, Perceptrons. • Multilayer Feed-Forward Networks, Bayesian Methods for Learning Belief Networks. • Reinforcement Learning, Passive Learning in a Known Environment, Passive Learning in an Unknown Environment, Generalization in Reinforcement Learning • Conclusion unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Publication
1	Artificial Intelligence, A Modern Approach	Stuart J. Russell and Peter Norvig	Edition 6, McGraw Hill Publications, 2010
2	Artificial Intelligence (Sie)	Knight Kevin	English Publications
3	Artificial Intelligence: An Essential Beginner's Guide to AI	Neil Wilkins	Bpb Publications

Code: BCCCCE1107 INTRODUCTION TO CLOUD COMPUTING 3 Credits [LTP:3-0-0]

COURSE OUTCOME: Students will be able to

- Students will learn the underlying principles of Cloud Technology and various types of cloud computing architecture and types.
- They will learn to evaluate between different cloud solutions offered by various providers based on their merits and demerits.

A. OUTLINF OF THE COURSE:

Unit	Title of the unit	Time required for the Unit (Hours)
1	Introduction	6
2	Cloud Computing Companies and Migrating to Cloud	7
3	Cloud Cost Management and Selection of Cloud Provider	7
4	Governance in the Cloud	8
5	Ten cloud do's and do not's	8

B. DETAILED SYLLABUS:

Unit	Unit Details
1.	**Introduction**
	• Introduction to Unit • Introduction to Cloud Computing, History and Evolution of Cloud Computing, Types of clouds, Private and Public clouds, Cloud Computing architecture, Cloud computing infrastructure, Merits of Cloud computing, Practical applications of cloud computing, Cloud computing delivery models and services (IaaS, PaaS, SaaS) • Obstacles for cloud technology, Cloud vulnerabilities, Cloud challenges, • Practical applications of cloud computing • Conclusion of the Unit
2.	**Cloud Computing Companies and Migrating to Cloud**
	• Introduction to Unit • Web-based business services, Delivering Business Processes from the Cloud: Business process examples, • Broad Approaches to Migrating into the Cloud, The Seven-Step Model of Migration into a Cloud, Efficient Steps for migrating to cloud • Risks: Measuring and assessment of risks, Company concerns Risk Mitigation methodology for Cloud computing, Case Studies • Conclusion of the Unit
3.	**Cloud Cost Management and Selection of Cloud Provider**

	• Introduction to Unit • Assessing the Cloud: software Evaluation, System Testing, Seasonal or peak loading, Cost cutting and cost- benefit analysis, selecting the right scalable application. • ConsiderationsforselectingcloudsolutionUnderstandingBestPracticesusedinselectionofCloudservice and providers, Clouding the Standards and Best Practices Issue: Interoperability, Portability, Integration, Security, Standards Organizations and Groups associated with Cloud Computing, Commercial and Business Consideration • Conclusion of the Unit
4.	**Governance in the Cloud**
	• Introduction to Unit • Industry Standards Organizations and Groups associated with Cloud Computing, Need for IT governance in cloud computing • Cloud Governance Solution: Access Controls, Financial Controls, Key Management and Encryption, Logging and Auditing, API integration • Legal Issues: Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Legal issues in Commercial and Business Considerations • Conclusion of the Unit
5	**Ten cloud do's and do not's**
	• Introduction to Unit • Don't be reactive • do consider the cloud a financial issue • don't go alone • do think about your architecture • don't neglect governance, don't forget about business purpose • do make security the centerpiece of your strategy • don't apply the cloud to everything don't forget about Service Management • do start with a pilot project • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Text / Reference Book	Author	Publication
1	Cloud Computing: Principles and Paradigms	Rajkumar Buyya, James Broberg, Andrzej M. Goscinski	John Wiley and Sons Publications, 2011
2	Brief Guide to Cloud Computing	Christopher Barnett	Constable & Robinson Limited, 2010
3	Handbook on Cloud Computing	Borivoje Furht, Armando Escalante, Springer	2010
4	Cloud Computing Theory and Practice	Dan C Marinescu, Elsevier	2013
5	Cloud Computing for Dummies	Judith Hurwitz, Robin Bloor, Marcia Kaufman & Fern Halper	Wiley Publishing, 2010

Code: BCSCCE1107 INTRODUCTION TO CYBER SECURITY 3 Credits [LTP: 3-0-0]

COURSE OUTCOMES:

Students can,

- Explain basic concepts and importance of information security
- Identify threats to information security, analyze their impact and propose suitable countermeasures
- Describe various aspects of securing network infrastructure and importance of classifying information

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Introduction to Information Security	6
2	The Need for IT Security – I	6
3	Advance Algorithms and Techniques	8
4	Key Management	8
5	Cryptography in User Authentication	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Information Security**
	• Introduction of Unit • Definition of Information Security, Evolution of Information Security; Basics Principles of Information Security; Critical Concepts of Information Security; Components of the Information System • Overview of Cryptography (What is Cryptography, Principles of Cryptography Techniques) • Understanding Mono-Alphabet Substitution Cryptographic Algorithms (Caesar Cipher, Stream Cipher) • Understanding Multi-Alphabet Substitution Cryptographic Algorithms (Simple substitution, Poly alphabetic substitution)
2.	**The Need for IT Security – I**
	• Introduction of Unit • Business Needs-Protecting the functionality • Enabling the safe operations • Protecting the data, safe guarding the technology assets

	• Conclusion of the Unit
3.	**Advance Algorithms and Techniques**
	• Introduction of Unit • Understanding Birthday Attack (What is Birthday Paradox, how to avoid it) • Asymmetric Key Algorithms and types (RSA, Diffie-Hellman key exchange, DSA) • Attacks-Malicious Codes, Back Doors, Denial of Service and Distributed Denial of Service, Spoofing, sniffing, Spam, Social Engineering • Conclusion of the Unit
4.	**Key Management**
	• Introduction of Unit • The basic functions involved in key management including creation • Distribution, verification, revocation and destruction, • Storage, recovery and life span and how these functions affect cryptographic integrity • Conclusion of the Unit
5.	**Cryptography in User Authentication**
	• Introduction of Unit • Basics of authentication, tokens, • Certificate-based and biometric authentication, • Extensible authentication protocols, and message digest, Security handshake • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Publication
1	Cryptography and Network Security	AtulKahate	McGraw Hill India, 2017
2	Cryptography and Network Security	S. Bose	Pearson India , 2016
3	Information security: Principles and Practice	Mark Stamp	John Wiley & Sons, Inc., 2011

Code: BTXCME2201	MACHINE DRAWING LAB	1 Credits [LTP: 1-0-2]

COURSE OUTCOME: The student would be able to:

CO1: analyze the concepts sectioning, true section and apparent section and create the sectional views of the engineering components.

CO2: analyze the development of surface and analyze the sheet metal requirement for fabricating a surface.

CO3: analyze the curves produced due to intersections of different surfaces.

CO4: create isometric views of various engineering components.

CO5: create multi view drawings of simple and complex engineering components

LIST OF EXPERIMENT

1.	Introduction to machine drawing
2.	Dimensioning, locations and placing
3.	**Orthographic projections**: First & third angle methods Drawing Sheet 1: Orthographic Projections (3 Problems) Drawing Sheet 2: Sectional Views (3 Problems) Drawing Sheet 3: Riveted joints, lap joints, butt joints, chain riveting, zig-zag riveting Drawing Sheet 4: Screw fasteners, different threads, Nuts & bolts locking devices, set screws, foundation Drawing Sheet 5: Bearing, Plumber block
4.	Instructions on free hand sketches List of free hand sketches • Different type of lines • Conventional representation of materials • Screw fasteners • Bearing: Ball, roller, needle, foot step bearing • Coupling: Protected type, flange, and pin type flexible coupling • Welded joints
Virtual Labs	
1	http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/egraphics_lab/labs/index.php

Code: BTXCSA1202	ENGINEERING PHYSICS LAB	1 Credit [LTP:1-0-2]

COURSE OUTCOME:- Students will be able to:

CO1: Analyze the concept of interference with the help of Newton's ring and dispersive power through prism.

CO2: Evaluate the resolving power through diffraction grating and double slit arrangement.

CO3: Apply the numerical aperture of optical fiber and Coherent length and time using He-Ne laser.

CO4: Evaluate the height of the unknown object by Sextant.

CO5: Analyze the mechanism of Ballistic Galvanometer and evaluate the specific resistance of wire through Carey's foster bridge.

A. LIST OF EXPERIMENTS:

1.	To determine the wave length of Sodium light by Newton's Ring
2.	To determine the dispersive power of material of a prism for violet, red and yellow color of mercury light with the help of spectrometer.
3.	To determine the wave length of prominent lines of mercury by plane diffraction grating with the help of spectrometer
4.	To verify the expression for the resolving power of Telescope
5.	To measure the numerical Aperture of an optical fibre by He-Ne laser
6.	To determine the coherent length and coherent time by using He-Ne laser
7.	To study the variation of a semiconductor resistance with temperature and hence determine the Band Gap of the semiconductor in the form of reverse biased P-N junction diode.
8.	To study the characteristics of semiconductor diode and determine forward and reverse bias resistance
9.	To Determine the height of a given line drawn on the wall by sextant
10.	To study the charging and discharging of a condenser and hence determine time constant (both current and voltage graphs are to be plotted)
11.	To determine the high resistance by method of leakage, using a ballistic galvanometer.
12.	To specify the specific resistance of a material of a wire by carey foster's bridge.
Virtual Labs	
1	http://vlab.amrita.edu/?sub=1&brch=282
2	http://vlabs.iitb.ac.in/vlab/labsps.html
3	https://praxilabs.com/en/virtual-labs.aspx?TAB=1#LOL

Code: BTXCEE1203 ELECTRICAL & ELECTRONICS ENGINEERINGLAB 1 Credit [LTP: 1-0-2]

COURSE OUTCOMES:- Students will be able to:

CO1 Analyze the house wiring connections of various equipment's such as energy meter, ceiling fan, tube light etc.

CO2 Create the connections of single phase and three phase induction motors.

CO3 Create circuits and connects of various electrical components such as Resistors, Inductors, Capacitors, PN-Diode. Zenger Diode, LED, LCD, etc.

CO4 Analyze the effect of L, C and L-C filters in single phase half wave and full wave bridge rectifier

CO5 Analyze the effect of LC and LC filters in current and power rectifiers

A. LIST OF EXPERIMENTS:

1	Assemble house wiring including earthing for 1-phase energy meter, MCB, ceiling fan, tube light, three pin socket and a lamp operated from two different positions. Basic functional study of components used in house wiring.
2	Prepare the connection of ceiling fan along with the regulator and vary the speed.
3	Prepare the connection of single phase induction motor through 1-Phase Auto-transformer and vary the speed.
4	Prepare the connection of three phase squirrel cage induction motor through 3-Phase Autotransformer and vary the speed.
5	Prepare the connection of Fluorescent Lamp, Sodium Vapour and Halogen Lamp and measure voltage, current and power in the circuit.
6	Identification, testing and application of Resistors, Inductors, Capacitors, PN-Diode. Zenger Diode, LED, LCD, BJT, Photo Diode, Photo Transistor, Analog/Digital Multi- Metres and Function/Signal Generator.
7	Measure the frequency, voltage, current with the help of CRO.
8	Assemble the single phase half wave and full wave bridge rectifier & the analyse effect of L, C and L-C filters in rectifiers.
9	Study the BJT amplifier in common emitter configuration. Measure voltage gain plot gain frequency response and calculate its bandwidth.
10	Verify the truth table of AND, OR, NOT, NOR and NAND gates
11	Prepare the connection of sodium lamp and measure voltage
12	Analyze the effect of LC and LC filters in current and power rectifiers
Virtual Lab	
1	http://vlabs.iitkgp.ernet.in/be/
2	http://em-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering

Code: BTXCME2204	WORKSHOP PRACTICE	1 Credits [LTP: 0-1-2]

COURSE OUTCOMES:- Students will be able

CO1: To Create a model of T Lap and T- Briddle Joint through carpentry shop

CO2: To Analyze the making of prototype model through foundry shop

CO3: To analyze the difference between gas welding and arc welding and their applications

CO4: To create a model on fitting shop through filling, slotting, drilling and tapping operation

CO5: To Analyze the difference between forging, moulding and casting

A. LIST OF EXPERIMENTS

1.	**Carpentry Shop** • Timber, definition, engineering applications, seasoning and preservation • Plywood and ply boards
2.	**Foundry Shop** • Moulding Sands, constituents and characteristics • Pattern, definition, materials types, core prints • Role of gate, runner, riser, core and chaplets • Causes and remedies of some common casting defects like blow holes, cavities, inclusions
3.	**Welding Shop** • Definition of welding, brazing and soldering processes and their applications • Oxyacetylene gas welding process, equipment and techniques, types of flames and their applications • Manual metal arc welding technique and equipment, AC and DC welding • Electrodes: Constituents and functions of electrode coating, welding positions, Types of welded joints, common welding defects such as cracks, undercutting, slag inclusion and boring
4.	**Fitting Shop** • Files, materials and classification.
5.	**Smithy Shop** • Forging, forging principle, materials, Operations like drawing, upsetting, bending and forge welding • Use of forged parts

List of Jobs to be made in the Workshop Practice

1.	**Carpentry Shop** : T – Lap joint and Bridle joint
2.	**Foundry Shop** : Mould of any pattern
3.	**Welding Shop** : Square butt joint by MMA welding and Lap joint by MMA welding
4.	**Machine Shop Practice :** Job on lathe with facing operation, Job on lathe with one step turning and chamfering operations and Job on shaper for finishing two sides of a job
5.	**Fitting Shop :** Finishing of two sides of a square piece by filing, Drilling operation on fitted job (two holes), Slotting operation on fitted job, Tapping operation on fitted job

Code: BTXCCE1205	Programming in C LAB	1 Credit [LTP: 0-1 -2]

COURSE OUTCOME:- On completion of the course, students will be able:

CO1: To prepare documents, worksheets and presentations using MS Word, Excel and PowerPoint.

CO2: To perform arithmetic and conditional operations using C Language.

CO3: To design program based on iterative statements using C Language.

CO4: To perform array operations to solve computer problems.

CO5: To demonstrate the use of pointers and structures.

A. LIST OF EXPERIMENTS:

	MS Office
1.	Implement basic features of MS Office, Prepare a document using MS-Word
2.	Prepare a Sheet using MS Excel and Slides using MS PowerPoint
	Programming In C
3.	Programs to demonstrate the use of input and output in C Language including data types and format specifiers.
4.	Program to evaluate arithmetic operations in C Language
5.	Program to apply conditional operators. (if-else, switch-case)
6.	Program to design program using iterative statements. (while, for and do-while)
7.	Program to implement input, output and manipulation operations on Array.
8.	Program to perform matrix addition and multiplication.
9.	Program to demonstrate declaration, definition, initialization and access operations on pointers.
10.	Program to solve problems of collection of different data types using structures.
Virtual Lab	
1	http://cse02-iiith.vlabs.ac.in/

Code: BTXCME1206	PRACTICAL GEOMETRY	1 Credit [LTP: 0-1-2]

COURSE OUTCOME:- Students will be able to:

CO1: Apply the concept of scale and their applications

CO2: Analyze the different applications of conic section and engineering curves and also how to draw on sheet

CO3: Analyze the use of projection and also analyze the difference between first and third angle projection method

CO4: Apply the concept of sectioning and draw sheet on section of solid

CO5: Analyze the use of development and their application

(Theory Concepts)

A. List of Experiments

1.	• Lines, Lettering and Dimension (Sketch Book) • Scales: Representative Fraction, plain scales, diagonal scales, (In drawing sheet)
2.	• Conic Sections: Construction of ellipse, parabola and hyperbola by different methods(in drawing sheet) Engineering Curves: Construction of Cycloid, Epicycloids, Hypo-cycloid(in drawing sheet)
3.	• Type of Projection, Orthographic projection: first angle and third angle projection (in drawing sheet) • Projection of Points, Projection of Straight lines, Projection of planes: Different positions of plane lamina like: regular polygon, circle of three planes (four problems in drawing sheet), Projection of Solids: Projection of right and regular polyhedron, cone (four problem in drawing sheet)
4.	• Sections of Solids: Projection of Frustum of a cone and pyramid(in drawing sheet)
5.	• Development of Surfaces: Parallel line and radial line method for right solids, Regular Solids (in drawing sheet) • Isometric Projections: Isometric Scale, Isometric axes, Isometric View of geometrical shapes (in drawing sheet)

(Practical Concepts)

6.	Introduction, Line (coordinate Methods), Dimension, Scale
7.	Rectangle, Conic Section, Construction of ellipse, Parabola & Hyperbola, Polygon, Circle
8.	AutoCAD commands (copy, Mirror, Move, Array, Block, Group, Join, Hatch etc.)
9.	Type of Projection , Orthographic projection: First Angle and Third Angle projection, Projection of Points, Projection of Straight lines, different positions of straight lines, Projection of planes, Projection of Solids: projection of right and regular polyhedron and cone
10.	Section of solids: projection of frustum of a cone and pyramid, Isometric projections,
Virtual Labs	
1	http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/egraphics_lab/labs/index.php

Code: BTXCHM1207	FOUNDATION ENGLISH	1 Credits [LTP: 0-0-2]

COURSEOUTCOME: On successful completion of the course, the learners will be able to:

CO	Cognitive Abilities	Course Outcomes
CO-01	**Understanding/ Applying/Creating**	Demonstrate the grammar skills involved in writing sentences and short paragraphs.
CO-02	**Understanding/ Applying**	Build up a good command over English grammar and vocabulary to be able to ace error spotting.
CO-03	**Understanding/ Applying/Creating**	Define unknown words in sentence level context using a picture dictionary or by creating a memory link for support.
CO-04	**Understanding / Applying**	Understand, analyze and effectively use the conventions of the English language.
CO-05	**Understanding/Applying**	Develop their interest in reading and enhance their oral and silent reading skills along with sharpen their critical and analytical thinking.

UNIT NO.	UNIT NAME	HOURS
1	Basics of Grammar	8
2	Spotting the grammatical errors and rectification	2
3	Vocabulary Building	4
4	Basics of Writing Skills	2
5	Reading Comprehension	8

LIST OF ACTIVITIES	
1.	Parts of Speech: Theory & Practice through various Exercises
2.	Sentence Structures: Theory & Practice through various Exercises
3.	Tenses: Theory & Practice through various Exercises
4.	Spotting the Errors: Applying the rules and Practice Questions
5.	Vocabulary Building-I: Practice by sentence formation
6.	Vocabulary Building-II: Practice by sentence formation
7.	Paragraph Writing
8.	Article Writing
9.	Précis Writing
10.	Formal & Informal Letter Writing
11.	Reading Comprehension- I: Beginner's level reading and Answering the Questions (Competitive Exams)
12.	Reading Comprehension- II Beginner's level reading and Answering the Questions (Competitive Exams)

Code: BTXCHM2208	LANGUAGE LAB	1 Credits [LTP:0-0-2]

COURSEOUTCOME: On successful completion of the course the learners will be able to

CO	Cognitive Abilities	Course Outcomes
CO-01	**Understanding/ Applying/Creating**	Understand the nuances of language through audio-visual experience and group activities.
CO-02	**Understanding/ Applying**	Neutralize the accent for intelligibility and develop confidence in speaking with clarity enhancing their employability skills.
CO-03	**Understanding/ Applying/Creating**	Demonstrate an understanding of grammatical structures in conversations and discussions.
CO-04	**Understanding / Applying**	Utilize the knowledge of confidence building strategies to manage one's own thoughts and emotions.
CO-05	**Understanding/Applying**	Identify the requirements of skills development and apply their learning to sharpen the same.

UNIT NO.	UNIT NAME	HOURS
1	**Introduction to Communication Skills on Learning Software**	**6**
2	**Concepts of Phonetics**	**4**
3	**Grammar Practice**	**2**
4	**Confidence Enhancement Activities**	**4**
5	**Skills Enhancement Activities**	**8**

LIST OF LABS	
1.	Listening Skills
2.	Reading Comprehension
3.	Writing Skills
4.	Phonetics I
5.	Phonetics II
6.	Grammar and Common Errors Usage
7.	Conversation
8.	Role Plays
9.	Presentation Skills I
10.	Presentation Skills II
11.	Group Discussion

12.	**Interview Skills**

Software used in Language Lab: EL-Client

S.No.	Topics	Exercises
I	Listening Skills: Fourteen Lessons each containing five exercises	
II	Fundamental Language Skills: Introductory Lessons Basic Lessons (a) Reading Basic Lessons (a) Grammar Basic Lessons (a) Vocabulary Basic Lessons (a) WritingBasic Lessons (b)-(c) Reading Basic Lessons (b)-(c) Grammar Basic Lessons (b) Vocabulary Basic Lessons (b) Writing	5exercises 6exercises 3exercises 6exercises 5exercises 9exercises 9exercises 5exercises 3exercises
III	Communication Skills: Reading Comprehension Vocabulary Grammar Writing Exercises on Reading, Vocabulary, Grammar and Writing	
IV	Vocabulary: Word mentor: Various games based on the formation of words.	
V	Phonetics: Consonants Vowels Dipthongs Intonation Correct Pronunciation	
VI	English as Second Language	45exercises
VII	Conversations: Nine topics for conversations.	

- Neutralization of accent for intelligibility
- Speaking with clarity and confidence thereby enhancing employability skills of the students

Code: BTXCSA2101	ENGINEERING CHEMISTRY	3 Credits [LTP: 3-0-0]

COURSE OUTCOME: The student would be able:

CO1: To develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.

CO2: To use their knowledge of polymers and glass and its use in industries and daily life.

CO3: To identify practices for the prevention and remediation of corrosion

CO4: To characterize the fuels and analyze the combustion mechanisms of various fuels.

CO5: To learn about the manufacturing of cement and the chemistry involved in setting and hardening of it and also learn about the suitable use of lubricants.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Water Technology	8
2.	Polymer and Glass	7
3.	Corrosion and its control	6
4.	Fuel and Fuel Analysis	8
5.	Binding Materials and Lubricants	7

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Water Technology**
	• Introduction of Unit **Water** Sources of water, Impurities in water and effect of impurities, Municipal water supply: Requisites of drinking water, Steps involved in purification of water, Sedimentation, Coagulation, Filtration and Disinfection, Break Point Chlorination **Water Analysis** Hardness of water; Type of hardness , Degree of hardness, Units of hardness ,Disadvantages of hard water, Determination of hardness by Complexometric (EDTA) method , Numericals based on hardness by EDTA method, Boiler Troubles : Formation of solids (scale and sludge), Carry over (Priming and Foaming), Caustic Embrittlement, Disadvantages and Prevention Treatment of hard water: Lime-soda method, Permutit (zeolite) method and Deionization or Demineralization method, Numerical problems based on Lime-soda and Zeolite softening methods, Desalination: Reverse osmosis, Electrodialysis • Conclusion of Unit
2	**Polymer and Glass**
	• Introduction of Unit **Polymers:** Introduction to Polymer chemistry:, Classification of Polymers and Types of polymerization, Plastics: Constituents of plastics, Thermosets and Thermoplastics, Preparation, Properties and Uses of Polyethylene, Bakelite, Teflon, Terylene and Nylon Elastomers: Natural rubber, Vulcanization, Synthetic rubber- Preparation, Properties and Applications of SBR, Buna-N, Butyl and Neoprene rubber. **Glass:** Introduction, Definition of glass, its Properties, Manufacturing of glass, Importance of annealing in glass making, Types of silicate glasses and their commercial uses. • Conclusion of Unit

3	**Corrosion and its control**
	• Introduction of Unit **Corrosion and its control** • Definition of corrosion and its Significance, Mechanisms of Corrosion: Chemical (Dry) corrosion and Electrochemical (Wet) corrosion, Types of corrosion: Galvanic corrosion, Concentration cell corrosion, Stress corrosion, Pitting corrosion, Factors affecting the rate of corrosion • Protection from corrosion : Material selection and design, Improvement of Environment , Coating of metallic surface, Cathodic protection, Anodic protection, Electroplating, Tinning, Galvanization and Modification in designs . Some practical examples of corrosion. • Conclusion of Unit
4	**Fuel and Fuel Analysis**
	• Introduction of Unit • Classification and general aspects of fuel., Solid fuel: Coal, Types of coal, Carbonization of coal • Liquid fuel: Processing of crude petroleum, Cracking, Thermal Cracking and Catalytic Cracking, Synthetic petrol (Coal to Liquid (CTL) Technology): Bergius and Fischer Tropsch process. Knocking, Octane number and Cetane number, Anti-knocking and Anti-knocking agents • Gaseous fuel: Advantages of gaseous fuel, Biogas, LPG, CNG • Analysis of Coal: Ultimate and Proximate analysis of coal, Calorific Value: Definition, Higher calorific value, Lower calorific value, Determination of higher & lower calorific value by Bomb Calorimeter, Fuel gas analysis by Orsat's apparatus and its significance • Numericals based on Bomb, Numericals based on combustion and requirement of oxygen/ air in combustion process • Conclusion of Unit
5	**Binding Materials and Lubricant**
	• Introduction of Unit **Binding Materials:** Cement: Composition and Significance of cement, Manufacturing of Portland cement by Rotary Kiln Technology, Chemistry of setting and hardening of cement and role of gypsum **Lubricants** Introduction of lubricants, Classification, Properties and Uses of lubricants, Mechanism of lubrication, Selection of lubricants, Properties of lubricants: Viscosity & Viscosity Index, Flash and Fire Point, Cloud and Pour Point, Carbon Residue, Oiliness, Aniline Point, Steam Emulsification Number, Precipitation Number and Neutralization Number • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Engineering Chemistry	P.C. Jain	Latest	DhanpatRai&Sons
2.	Engineering Chemistry.	S. S. Dara	Latest	S. Chand & Co.
3.	Chemistry in Engineering & Tech.	Rajaram, Kuriacose	Latest	Tata McgrawHill
4.	Physical Chemistry	P.W. Atkins	Latest	Oxford University Press.
Important Web Links:				
1.	https://civilengineersforum.com/cement-manufacturing-process/			
2.	https://www.explainthatstuff.com/lubricants.html			
3.	https://nptel.ac.in/courses/122/101/122101001/			

Code: BCECCE2210	Introduction to Web Technology	1 Credits [LTP: 0-1-2]

COURSE OUTCOME:

Web Technology has revolutionized mankind and entirely changed the way we look at things. Banking, Education, Retailing, Manufacturing and Research are some of the things that have undergone major transformations due to influence from web development. By adding more features, increasing the scope and reach of industries, making it available to users irrespective of their geography, web has captivated the human minds. Learning web technology is one of the top priorities for every computer enthusiast in order to better understand its working and scope. Students will understand the fundamental working technology behind web development and HTML. They will be taught concepts like JS, HTML5 thus making them capable of web development.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Introduction to the Internet and the World Wide Web	8
2	HTML & CSS	8
3	XML and HTML5, CSS3	8
4	PHP Server side scripting	6
5	Practical website development	6

B. DETAILED SYLLABUS

Unit	Unit Details
1	**Introduction to the Internet and the World Wide Web**
	• Introduction, History of internet, Internet Design Principles, Internet Protocols - FTP, TCP/IP, SMTP, Telnet, etc., Client Server Communication, Web System architecture • Evolution of the Web, Web architectures, Web clients and servers, Static and Dynamic Web Applications, Front end and back end web development. • HTML, CSS, JS, XML; HTTP, secure HTTP, etc; URL, Web Services – SOAP, REST
2	**HTML & CSS**
	• Introduction to Html, Html Document structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; • More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div tag ; Html forms - Input type, Text area, Select , Button, Images. • Introduction to CSS, Syntax, Selectors ,Embedding CSS to Html, Formatting fonts, Text & background colour, Inline styles, External and Internal Style Sheets, Borders & boxing

3	**XML and HTML5, CSS3**
	• Introduction to XML, Difference b/w Html & XML, XML editors, XML Elements & Attributes XML DTD, XML Schema, XML Parser, Document Object Model (DOM), XML DOM. • Introduction to HTML5, CSS3, New features, Local storage, Web Sockets, Server events, Canvas, Audio & Video, Geolocation, Microdata, Drag and Drop. Browser life cycle and browser rendering stages. Service workers
4.	**PHP Server side scripting**
	• Introduction to PHP, Basic Syntax, Variables, constants and operators, Loops, Arrays Strings, • Environment & environment variables, responding to HTTP requests, Files, Cookies, Sessions, Examples.
5	**Practical website development**
	• Commonly used Web Servers and browsers, Setting up a server and domain name, website types and structures, • Web authoring tools, Web hosting, website maintenance, generating traffic to your website.

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Book	Author	Publication
a.	**Reference Books**		
1	Practical Web Design for Absolute Beginners	Adrian W. West	Apress 2016
2	Introducing Web Development	Jorg Krause	Apress 2017
3	HTML & CSS: The Complete Reference	Thomas Powell	McGraw Hill, Fifth Edition, 2010
4	Creating a Website: The Missing Manual	Mathew Macdonald. O'Reilly	3rd Edition

Code: BADCCE2210	Programming in Python	1 Credits [LTP: 0-1-2]

COURSE OUTCOME:

Basics of Python programming, Decision Making and Functions in Python, Object Oriented Programming using Python, Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python, Express different Decision Making statements and Functions, Interpret Object oriented programming in Python, Understand and summarize different File handling operations.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Introduction to Python Environment	7
2.	Data Structures, Looping and Branching	7
3.	Data Management	7
4.	Data Transformation	7
5.	Python for Statistics	8

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Introduction to Python Environment**
	• Introduction of Unit • History and development of Python, Why Python? Grasping Python's core philosophy, Discovering present and future development goals, Working with Python : Getting a taste of the language, Understanding the need for indentation, Working at the command line or in the IDE, Visualizing Power, Using the Python Ecosystem for Data Science. • Accessing scientific tools using SciPy, Performing fundamental scientific computing using NumPy, Performing data analysis using pandas, Implementing machine learning using Scikit-learn, Plotting the data using matplotlib, Parsing HTML documents using Beautiful Soup, • Setting Up Python for Data Science, Getting Continuum Analytics Anaconda, Getting Enthought Canopy Express, Getting pythonxy, Getting Win Python, Installing Anaconda on Windows, Linux and MAC • Conclusion of unit
2.	**Data Structures, Looping and Branching**
	• Introduction of Unit • Working with Numbers and Logic, Performing variable assignments, Doing arithmetic, Comparing data using Boolean expressions, Creating and Using Strings, Interacting with Dates, Creating and Using Functions, Calling functions in a variety of ways, Using Conditional and Loop Statements. • Making decisions using the if statement, Choosing between multiple options using nested decisions,

	• Performing repetitive tasks using for, Using the while statement. • Storing Data Using Sets, Lists, and Tuples : Performing operations on sets, Working with lists, Creating and using Tuples, Defining Useful Iterators, Indexing Data Using Dictionaries. • Conclusion of unit
3.	**Data Management**
	• Introduction of Unit • Working with Real Data, Working with Real Data, Uploading small amounts of data into memory, Streaming large amounts of data into memory, Sampling data, Accessing Data in Structured Flat-File Form, Sending Data in Unstructured File Form, Managing Data from Relational Databases, Interacting with Data from NoSQL Databases. • Accessing Data from the Web, Juggling between NumPy and pandas, Validating Your Data, Removing duplicates, Manipulating Categorical Variables, Dealing with Dates in Your Data, Dealing with Missing Data, Slicing and Dicing. • Filtering and Selecting Data, Concatenating and Transforming Working with HTML Pages, Working with Raw Text, Working with Graph Data. • Conclusion of unit
4.	**Data Transformation**
	• Introduction of Unit • Understanding classes in Scikit-learn, Playing with Scikit-learn, Defining applications for data science, performing the Hashing Trick, Using hash functions, Demonstrating the hashing trick, Working with deterministic selection, Considering Timing and Performance, Benchmarking with timeit, Working with the memory profiler, Performing multicore parallelism, Demonstrating multiprocessing.program to Count Number of words, MapReduce Work Flows • Conclusion of unit
5.	**Python for Statistics**
	• Introduction of Unit • Exploring Data Analysis, The EDA Approach, Defining Descriptive Statistics for Numeric Data, Measuring central tendency, Measuring variance and range, Working with percentiles, Defining measures of normality, Counting for Categorical Data, Understanding frequencies, Creating contingency tables. Creating Applied Visualization for EDA, Inspecting boxplots, Performing t-tests after boxplots, Observing parallel coordinates, Graphing distributions, Plotting scatterplots, Using covariance and correlation, Using nonparametric correlation, Considering chi-square for tables. • Using the normal distribution, Creating a Z-score standardization, Transforming other notable distributions, Detecting Outliers in Data, Clustering, Reducing dimensionality. • Conclusion of unit

C. RECOMMENDEDSTUDYMATERIAL:

Sr.No	Book	Author	Publication
1.	Python for Data Science for Dummie	Luca Massaron and John Paul Mueller	John Wiley
2.	Python for Data Analysis	Dirk deRoos, Paul C. Zikopoulos	O'Reilly Media

Code: BTXCSA2101	ENGINEERING CHEMISTRY LAB	1 Credit [LTP: 0-0-2]

COURSE OUTCOME: The student would be able:

CO1 To analyze hardness and fluoride content of water

CO2 To analyze the strength of NaOH and Na_2CO_3 solutions.

CO3 To analyze hardness strength of Ferrous Ammonium sulphate solution and $CuSO_4$ solution

CO4 To analyze different properties of lubricating oil.

CO5 To handle different instruments & analytical techniques.

A. LIST OF EXPERIMENTS

EXPERIMENTS	
1.	To determine the hardness of water by EDTA method.
2.	To determine the amount of fluoride in drinking water
3.	To determine the strength of NaOH and Na_2CO_3 in a given alkali mixture.
4.	To determine the strength of Ferrous Ammonium sulphate solution with the help of $K_2Cr_2O_7$ solution using diphenyl amine as internal indicator.
5.	To determine the strength of $CuSO_4$ solution with the help of hypo solution.
6.	To determine the acid value of a given oil.
7.	To determine the viscosity of a given lubricating oil by Redwood viscometer.
8.	To determine the flash and fire point of a given lubricating oil.
9.	To determine the cloud and pour point of a given oil.
10.	Synthesis of Bakelite
11.	To determine the calorific value of a fuel by Bomb Calorimeter.
12.	To determine the Saponification No. of a given oil.
Virtual Labs	
1.	https://www.youtube.com/watch?v=RzAPQPWOlNI

Code: BEECSA3101	ADVANCE MATHEMATICS	3 Credits [LTP: 3-1-0]

COURSE OUTCOMES: After Successful completion of the course students will be able to-

CO1 Define real life application base problem for Ordinary Differential Equations using Laplace Transformer and their properties.

CO2 Apply Fourier Transform in the Industrial based studies and their properties

CO3 Analyze Industrial application base studies for Z Transform and their properties

CO4 Create the complex function and their properties

CO5 Evaluate solution of singular series by Taylor's and Laurent's series.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Laplace Transform	8
2.	Fourier Transform	9
3.	Transforms	9
4.	Complex Variables-I	9
5.	Complex Variables-II	9

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Laplace Transform**
	• Introduction • Laplace transform with its simple properties • Applications to the solution of ordinary and partial differential equations having constant coefficients with special • reference to wave and diffusion equations • Digital transforms • Conclusion and Summary of Unit
2.	**Fourier Transform**
	• Introduction of Unit • Discrete Fourier transform, Fast Fourier transform, Complex form of Fourier transform and its inverse applications • Fourier transform for the solution of partial differential equations having constant coefficients with special reference • to heat equation and wave equation • Conclusion of Unit
3.	**Transforms**

	• Introduction of Unit • Z-transforms, its inverse, simple properties and application to difference equations. • Conclusion and Summary of Unit
4.	**Complex Variables-I**
	• Introduction of Unit • Analytic functions, Cauchy–Riemann equations • Elementary conformal mapping with simple applications • Line integral in complex domain • Cauchy's theorem, Cauchy's integral formula • Conclusion and Summary of Unit
5.	**Complex Variables-II**
	• Introduction of Unit • Taylor's series, Laurent's series • Poles, residues • Evaluations of simple definite real integrals using the theorem of residuesI • Simple contour integration • Conclusion and Summary of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Mathematics III	Gaur & Kaul	Latest	JPH
2.	Mathematics III	Parihar andAgarwal	Latest	Aashirwad Publication
3.	Higher Engineering Mathematics	B V Ramannath	Latest	TMH
4.	Higher Engineering Mathematics	B S Grewal	Latest	---
Websites				
• khanacademy.com • https://nptel.ac.in/courses/111105134/				

Code: BERCEE3102	Electrical Machines	3 Credits [LTP: 3-1-0]

COURSE OUTCOMES: After Successful completion of the course students will be able to

CO1 Study DC machine principle, emf equation and – Characteristics of Motor and Generator – Starting, Speed control and braking of D.C. Motor

C02 Define the transformer principle, construction and Types of Transformer - EMF equation, equivalent circuits, and phasor diagrams.

CO3 Study the Induction machine behavior

CO4 Test Torque-slip characteristics and speed control method of Induction machine

C05 Develop the synchronous machine applications

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit
1.	D.C. Machines	7
2.	Transformers	9
3.	Single Phase Induction Motors And Special	9
4.	Three Phase Induction Motors	9
5.	Synchronous Machines	10

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**D.C. Machines**
	• Introduction of Unit • D.C. Machines – Principle of operation and construction of motor and generator – torque and EMF • equation – Various excitation schemes – Characteristics of Motor and Generator – Starting, Speed • control and braking of D.C. Motor • Conclusion and Summary of Unit
2.	**Transformers**
	• Introduction of Unit • Principle , Construction and Types of Transformer - EMF equation - Equivalent circuits – • Phasor diagrams - Regulation and efficiency of a transformer-three phase transformer Connection • Conclusion and Summary of Unit
3.	**Single Phase Induction Motors And Special Machines**

	• Introduction of Unit • Types of single phase induction motors –Double field revolving theory- Capacitor start capacitor run • motors – Shaded pole motor – Repulsion type motor – Universal motor – Hysteresis motor - • Conclusion and Summary of Unit
4.	**Three Phase Induction Motors**
	• Introduction of Unit • Induction motor-principle of operation, • Types , Torque-slip characteristics - Starting methods and • Speed control of induction motors. • Conclusion and Summary of Unit
5.	**Synchronous Machines**
	• Introduction of Unit • Permanent magnet synchronous motor – Switched reluctance motor – Brushless D.C motor. • Principle of Operation, type - EMF Equation and Phasor diagrams - Synchronous motor- • Rotating Magnetic field Starting Methods , Torque V-Curves, inverted – V curves • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	The Performance and Design of Direct Current Machines	Albert. E. Clayton, N.N. Hancock	Latest	Oxford
2.	Alternating Current Machines	Say. M.G.,	Latest	ELBS & Piman, London
3.	Utilization of Electrical Power	Rajput,R.K.	Latest	Laxmi publications
4.	Electrical Technology	Theraja, B.L. and Theraja,	Vol.II, 22^{nd} Ed	S.Chand
5.	Electric Machines	Nagrath,I.J	Latest	Tata Mc Grawhill
Websites				
khanacademy.com https://nptel.ac.in/courses/108/102/108102146/				

Code: BERCEE3103 Electrical & Electronics Measurements & Instrumentation
3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able to-

CO-1 Apply the methods of measurement, Characteristics of instrument like Electrodynamics, Thermo couple, Electrostatic & Rectifier type ammeters & voltmeters, Electrodynamics Wattmeter.

CO-2 Analyze the Instrument Transformers, errors in CT and PT and measurement of speed, frequency and power factor.

CO-3 Study the measurement quantities using methods of measuring low, medium and high resistances for Inductance & Capacitance with the help of AC bridges.

CO-4 Evaluate the AC potentiometer & magnetic measurement using flux meter.

CO-5 Define the Concepts of digital measurement Frequency meter, Spectrum Analyzer, Electronic multi meter, Cathode ray oscilloscope and Transducers

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Philosophy of measurement & Analog measurement of Electrical Quantities	8
2.	Power Measurement and Instrument Transformers	9
3.	Measurement of Parameters	8
4.	Ac Potentiometers & Magnetic measurement	8
5.	Digital Measurement and Transducer	10

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Philosophy of measurement & Analog measurement of Electrical Quantities**
	Introduction of Unit, Methods of measurement, Measurement system, Classification of Instrument system. Characteristics of instrument & measurement system, Errors, Electro static & Rectifier type, Ammeters & voltmeters. PMMC, MI, Electro dynamometer, Conclusion of Unit
2.	**Power Measurement and Instrument Transformers**
	Introduction of Unit, Electrodynamics Wattmeter, Three phase wattmeter, Power in three phase system, Errors in Measurement System & remedies in wattmeter and Energy meter Instrument Transformers: CT and PT, Errors in CT and PT. Applications of CT & PT in the extension of instruments range, Introduction to measurement of speed, frequency and power factor, Conclusion of Unit

3.	**Measurement of Parameters**
	• Introduction of Unit • Different methods of measuring low, medium and high resistances. Measurement of Inductance & Capacitance with the help of AC bridges. Q meter. • Conclusion of Unit
4.	**AC Potentiometer & Magnetic measurement**
	• Introduction of Unit • Polar type & co-ordinate type AC Potentiometers, Application of AC Potentiometers in Electrical Measurement Ballistic galvanometer, Flux meter, Determination of Hysteresis loop, Measurement of iron losses. • Conclusion of Unit
5.	**Digital Measurement and Transducers**
	• Introduction of Unit • Concepts of digital measurement block diagram, study of digital voltmeter. • Frequency meter, Spectrum Analyzer, Electronic multi meter, Cathode ray oscilloscope- Basic CRO circuit (block diagram), Cathode Ray Tube (CRT) & its components, Applications of CRO in measurement, • Lissajous pattern, dual trace & dual beam oscilloscopes, Transducers: Classification, characteristics, factors affecting the choice of transducers, Potentiometers, strain gauges, Resistance thermometer, Thermistor, Thermocouples, LVDT, RVDT. • Conclusion of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Electronic Inst. &Measurement	H.S.Kalsi	Latest	Tata Mc-GrawHill
2.	Electrical Measurements	Morris	Latest	ELSEVIER
3.	Electronic Instrumentation	BELL	Latest	Oxford
4.	Electronic Inst. & Measurement Techniques	W.D.Cooper	Latest	Prentice Hall,India

Websites

- www.metering.com
- www.iso.org
- www.bis.org.in /IS13779
- khanacademy.com

Code: BERCCE3104 Computer organization and Architecture-3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able to-

CO1 Study the design of Basic computer organization.

CO2 Define the General Register Organization.

CO3 Analyze the Memory Organization

CO4 Evaluate the Parallel Computer Structures.

CO5 Apply the Concepts of Pipelining and Vector processing in real applications

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the
1.	Basic computer organization and design	8
2.	General Register Organization	9
3.	Memory Organization	8
4.	Parallel Computer Structures	8
5.	Pipelining and Vector processing	10

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Basic computer organization and design**
	• Introduction of Unit • Operational concepts, Instruction codes, Computer Registers • Computer Instructions , Memory locations, Memory • Instruction cycle, Timing Signals, Control Signals • Bus organization • Conclusion of Unit
2.	**General Register Organization**
	• Introduction of Unit • Stack Organization. • Addressing modes. • Instruction Classification • Program control • Conclusion of Unit
3.	**Memory Organization**
	• Introduction of Unit • Memory Hierarchy, Main Memory, • Organization of RAM , SRAM, DRAM • Read Only Memory, PROM, EROM,EEPROM

	• Auxiliary memory, Cache memory, Virtual Memory • Memory mapping Techniques • Conclusion of Unit
4.	**Parallel Computer Structures**
	• Introduction of Unit • Introduction to parallel processing. Pipeline computers • Multi-processing systems. • Architectural classification scheme-SISD , Architectural classification scheme-SIMD, classification scheme- MISD, Architectural classification scheme- MIMD • Conclusion of Unit
5.	**Pipelining and Vector processing**
	• Introduction of Unit • Introduction to pipelining Vector processing • Array Processors • Conclusion of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Computer Systems Architecture	M.Morris Mano	Latest	Pearson Education
2.	Computer Architecture and parallel processing	KaiHwangandFA Briggs	Latest	Mc GrawHills
3.	Computer Organization	Carl Hamacher	Latest	Tata Mc GrawHill
4.	Computer Architecture &Organization	John PHayes	Latest	Mc GrawHill
5.	Computer Organization and Architecture	William Stallings	Latest	Pearson Education
Websites				
• https://onlinecourses.nptel.ac.in/noc21_cs61/preview • https://nptel.ac.in/courses/106106166 • https://nptel.ac.in/courses/106102157				

Code: BEREEE3111	Analog and Digital Circuits	3 Credits [LTP: 3-1-0]

COURSEOUTCOMES: After Successful completion of the course students will be able to-

CO1 - Study theory and applications of Electronics Devices.

CO2- Apply concepts of Transistor Amplifier and Operational Amplifier and their applications in engineering and technology.

CO3- Develop Feedback and oscillator Circuits in electrical and electronics engineering field.

CO4- Define Number System and Boolean algebra

CO5- **D**esign Combinational Logics.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Electronics Devices	8
2.	Transistor Amplifier and Operational Amplifier	9
3.	Feedback and oscillator Circuits	9
4.	Number System and Boolean Algebra	9
5.	Analysis & design of Combinational Logic	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Electronics Devices**
	• Introduction of UnitI • P-N Junctions: Diode theory, Bipolar Junction Transistors(BJT): Transistor fundamentals, transistor Analog Electronics configurations, DC operating point, BJT characteristics & parameters, fixed bias, emitter bias with and without emitter resistance, analysis of above circuits and their design, variation of operating point and its stability. • Field-Effect Transistors (FET): JFET-current-voltage characteristics, effects in real devices, high-frequency and high-speed issues. • Conclusion and Summary of Unit
2.	**Transistor Amplifier and Operational Amplifier**
	• Introduction of Unit • Transistors Amplifier: Small Signal BJT amplifiers: AC equivalent circuit, hybrid, re model and their use in amplifier design. Multistage amplifiers, frequency response of basic & compound configuration, Power amplifiers: Class A, B, AB, C and D stages, IC output stages. • Operational Amplifiers: Op-Amp Basics, practical Op-Amp circuits, differential and common mode operation, Inverting & Non Inverting Amplifier, differential and cascade amplifier, Op-Amp applications. Conclusion and Summary of Unit

3.	**Feedback and oscillator Circuits**
	• Introduction of Unit • Feedback & Oscillator Circuits Effect of positive and negative feedbacks, feedbacks, basic feedback topologies & their properties, properties, Analysis of practical feedback amplifiers, Sinusoidal Oscillators (RC, LC and Crystal), Multi-vibrators, The 555timer. • Conclusion and Summary of UnitI
4.	**Number System and Boolean Algebra**
	• Introduction of Unit • NumberSystems:Decimal,binary,octal,hexadecimalnumbersystemandconversion,binaryweighted codes,signed numbers, 1s and 2s complement codes, Binary arithmetic • BooleanAlgebra:Binarylogicfunctions,Booleanlaws,truthtables,associativeanddistributivep roperties,De-Morgans theorems, realization of switching functions using logic gates • Conclusion and Summary of Unit
5.	**Analysis & design of Combinational Logic**
	• Introduction of Unit • Combinational Logic: Switching equations, canonical logic forms, sum of product & product of sums, Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions, Quine-Mc Cluskey minimization technique, mixed logic combinational circuits, multiple output functions. • Analysis & design of Combinational Logic: Introduction to combinational circuits, code conversions, decoder, encoder, priority encoder, multiplexers as function generators, binary adder, subs tractor, BCD adder, Binary comparator, arithmetic logic units • Sequential Logic, Sequential Circuits, Programmable Logic, Digital integrated circuits. • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr.No	Reference Book	Author	Editio	Publication
1.	Microelectronics Circuits	A.S. Sedra & K.C.Smith	Latest	Oxford University Press
2.	Electronic Principles	A.P.Malvino	Latest	TMH
3	Electronic Devices & Circuit	RobertL.Boylestad&LouisNashelsky	Latest	Pearson
4	Electronic devices and circuits	JacobMillman,andC.C.Halkias	Latest	TMH
5.	Digital Electronics	WilliamKleitz	Latest	PHI

Websites

- https://nptel.ac.in/courses/108102112https://nptel.ac.in/courses/108105158
- https://nptel.ac.in/courses/117103064

Code: BEREEE3112 DATA STRUCTURE 3 Credits [LTP: 3-1-0]

COURSEOUTCOMES: After Successful completion of the course students will be able to

CO1 Define the concepts of array, Linked List and Interpreting their applications.

CO2 Apply the concepts of Trees with the help of example.

CO3 Differentiate between the sorting and has thing with their applications

CO4 Analyze the role of algorithms in computing with example.

CO5 Apply the Elementary Graph Algorithms with example in real problems.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction And Basic Data Structures	7
2.	Advanced Data structures	9
3.	Sorting And hashing	10
4.	Algorithm design techniques	9
5.	Graphs algorithms	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Introduction And Basic Data Structures**
	• Introduction of Unit • Problem solving techniques and examples • Abstract Data Type (ADT)-The list ADT Arrays- Stacks and Queues: Implementation and Application, Circular Queues. • Conclusion and Summary of Unit
2.	**Advanced Data structures**
	• Introduction of Unit • Trees: Preliminaries-Binary Tree- Tree traversals-Binary search Trees-AVL Trees. • Conclusion and Summary of Unit
3.	**S sorting And hashing**
	• Introduction of Unit • Sorting by Selection- Sorting by Insertion- Sorting by Exchange- Sorting by Diminishing Increment-Heap • Sort- Heaps Maintaining the Heap Property-Building a Heap- Heap sort Algorithm-Quick sort- • Description-Performance of quick sort-Analysis of Quick Sort. Hashing - General idea-Hash functions- • Separate Chaining-Open Addressing-Rehashing-Extendible Hashing. • Conclusion and Summary of Unit
4.	**Algorithm design techniques**

	• Introduction of Unit • The role of algorithms in computing-Getting Started-Growth of functions. Divide and conquer dynamic • programming-Greedy Algorithm –Backtracking • Conclusion and Summary of Unit
5.	**Graphs algorithms**
	• Introduction of Unit • Elementary Graph Algorithms-Minimum Spanning Trees-Single-source shortest paths- • All pairs shortest paths. • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Havowitz & Sawhni	Data structures in C & C++	2nd	BPB Publication
2	Data structures in Pascal	Havowitz &Sawn	2nd	BPB Publication
3	Data structures in C	Tannenbaum	3rd	PHI
4	Data Structures and Algorithms	PAI	3rd	TMH
5	Introduction to Data Structures with Applications	TREMBLAY	2nd	TMH

Websites

- www.electronicsdevices.com/; www.pearsonhighered.com;www.khanacademics.com
- www.mindtools.com
- www.tryscience.com
- www.khaki.com
- www.Raifoundation.org
- www.tryingineering.com
- https://nptel.ac.in/courses/106102064/

Code: BEREEE3113 Renewable and Alternate Energy 3 Credits [LTP: 3-1-0]

COURSEOUTCOMES: After Successful completion of the course students will be able-

CO1 – To study the Need, importance and scope of non-conventional and alternate energy resources.

CO2 - To develop significance solar energy Applications

CO3 - To define Wind Energy Conversion System

CO4 - To understand the role of ocean energy in the Energy Generation.

CO5 - To develop Biogas plants and geothermal energy

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Solar Energy	7
2.	Wind Energy	9
3.	Ocean Energy	10
4.	Bio-Mass	9
5.	Geothermal Energy & Energy Conservation	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**SOLAR ENERGY**
	• Introduction of Unit • Solar Radiation, Measurements of Solar Radiation, Flat Plate And Concentrating Collectors, Solar Direct Thermal Applications, Solar Thermal Power Generation, Fundamentals of Solar Photo Voltaic Conversion, Solar Cells, Solar PV Power Generation, Solar PV Applications.. • Conclusion and Summary of Unit
2.	**WINDENERGY**
	• Introduction of Unit • Wind Energy Estimation, Types of Wind Energy Systems, Performance, Site Selection, Details of Wind Turbine Generator. • Conclusion and Summary of Unit
3.	**OCEAN ENERGY**
	• Introduction of Unit • Ocean Thermal Energy Conversion (OTEC), Principle of operation, development of OTEC plants, Tidal and wave energy, Potential and conversion techniques, mini-hydel power plants. • Conclusion and Summary of Unit
4.	**BIO-MASS**

	• Introduction of Unit • Principles of Bio-Conversion, Anaerobic/aerobic digestion, • Types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking. • Conclusion and Summary of Unit
5.	**GEOTHERMALENERGY&ENERGYCONSERVATION**
	• Introduction of Unit • Resources, types of wells, methods of harnessing the energy, scope in India. Principles of energy conservation, • Different energy conservation appliances, cooking stoves, Benefits of improved cooking stoves over the traditional cooking stoves • Conclusion and Summary of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Expert Handbook for Planning, Design and Installation	NA	NA	Earthscan Ltd
2	Solar Water and Pool Heating Manual	NA	NA	Florida Solar
3	Planning and Installing Solar Thermal Systems: A Guide for Installers, Architects and Engineers	NA	NA	Kindlee Book

Websites

- www.electronicsdevices.com/; www.pearsonhighered.com;www.khanacademics.com
- www.mindtools.com
- www.tryscience.com
- www.khaki.com
- www.Raifoundation.org
- www.tryingineering.com
- https://nptel.ac.in/courses/103107157/

Code: BEECEE3201	Electrical Machine Lab	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO 1	Examine Speed control of D.C. shunt motor by Field current control method and by Speed control of a D.C. Motor by Ward Leonard method.
CO 2	Investigate the efficiency of D.C. Shunt motor by loss summation (Swinburne's) method and by Hopkinson's test.
CO3	Evaluate the O.C. and S.C. test, back to back test and parallel operation of single phase transformer.
CO 4	Analyze the efficiency and voltage regulation of single phase transformer and OC-SC test for efficacy for 3 phase transformer.

LIST OF EXPERIMENTS:

1.	Speed control of D.C.shunt motor by (a) Field current control method (b) Armature voltage control method. (c) Ward Leonard method and draw the characteristics.
2.	To determine the efficiency of D.C.Shunt motor by (a) loss summation (Swinburne's) (b) Hopkinson's regenerative test
3.	To perform (a) O.C.andS.C.testona1-phase transformer (b) back-to-back test on two identical1-phase transformers and find their efficiency & parameters of the equivalent circuit.
4.	To perform parallel operation of two (a)1-phase transformers (b) 3-phase transformers and determine their load sharing
5.	To study the performance of 3-phase transformer for its various connections, i.e .star/ star star / delta delta / star and delta/delta and find the magnitude of 3rd harmonic c u r r e n t .
6.	To perform parallel operation of two (a) 1-phase transformers (b) 3-phase transformers and determine their load sharing
7.	To perform no load and blocked rotor test on a 3 phase induction motor and to determine the parameters of its equivalent circuits. Draw the circle diagram and compute the following (i) Max.Torques (ii) Current (iii) slip (iv) p.f. (v) Efficiency.
8.	To perform the load test on a 3-phase induction motor and determine its performance characteristics (a) Speed vs load curve (b) p.f. vs load curve (c) Efficiency vs load curve (d) Speed vs torque curve
9.	To plot the O.C.C.& S.C.C.of an alternator and to determine its regulation by synchronous impedance method.
10.	To plot the V-curve for a synchronous motor for different values of loads.
11.	To synchronize an alternator across the infinite bus (RSEB) & summarize the effects of variation of excitation on load sharing.

Virtual Lab-
http://www.vlab.co.in/ba-nptel-labs-electrical-engineering.

Code: BERCCE3202	Data Structure Lab	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO1	Illustrate the programing applications.
CO2	Analyze the inheritance concept.
CO3	Examine the operator and function overloading concept.
CO4	Implement the friend function concept.
CO5	Perform Template Concept.

LIST OFEXPERIMENTS:

1.	Write a program to find the greatest between four numbers.
2.	Write a program to prepare mark sheet of students using structures.
3.	Write a C program to read several different names and addresses, re-arrange the names in alphabetical order and print name in alphabetical order using structures.
4.	Write a program to implement the operator and function overloading concept
5.	Write a program to implement the friend function concept.
6.	Write a program to implement the inheritance concept.
7.	Write a program to calculate the power function (mn) using the function overloading technique; implement it for power of integer and double.
8.	Implement file creation and operate it in different modes: seek, tell, read, write and close operations.
9.	Using multiple in heritance, prepare students' mark sheet. Three classes containing marks for every student in three subjects. The inherited class generate mark sheet.
10.	Write a program to implement the Template Concept

Virtual Lab- https://cse01-iiith.vlabs.ac.in/

Code: BERCCE3203 Measurement and Instrumentation Lab 1 Credit [LTP: 0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO1 Study ac voltmeter, ac ammeter and error.

CO2 Evaluate the power and power factor in electrical circuits

CO3 Develop various parameters like inductance, frequency and capacitance by Anderson's bridge and maxwell's bridge, CRO, Wein's bridge.

CO4 Design various parameters like inductance, frequency and capacitance by Anderson's bridge and maxwell's bridge, CRO, Wein's bridge.

CO5 Examine and investigate the semiconductor diode voltmeter, strain/force with help of strain gauge cell, transducer (1) PT-100 (2) RTD (3) Thermistor and thermocouple

LIST OF EXPERIMENTS:

1	Calibration of ac voltmeter and ac ammeter.
2	Measurement off orm factor of arectified sine wave and determine source of error r.m.s. value is measured by a multi meter
3	Measurement of displacement with help of L V D T...
4	Measurement of power and power factor of a single phase inductive load and to study effect of capacitance across the load on power factor
5	Measure Low resistance by Kelvin's double b r i d g e.
6	Measurement of voltage ,current and resistance using dc potentiometer
7	Measure inductance using Anderson's bridge and Maxwell's bridge
8.	Measurement of phase difference and frequency using CRO (LISSAJOUS FIGURES).
9	Measurement of capacitance and unknown frequency using Wein's bridge.
10	Study of semiconductor diode voltmeter and its use as DC average responding AC voltmeter
11	Measurement of strain/force with help of strain gauge c e l l.
12	Study of the following transducer(1) PT-100 (2) RTD (3) Thermistor and thermocouple

Virtual Lab-http://202.3.77.143/virtuallab/

Code: BERCCE3204 Introduction to MATLAB 1 Credit [LTP: 0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO1 Understand the main features of the MATLAB development environment

CO2 Use the MATLAB GUI effectively

CO3 Design simple algorithms to solve problems

CO4 Write simple programs in MATLAB to solve scientific and mathematical problems

CO5 Design and solve Simulink problems

LIST OF EXPERIMENTS:

1.	MATLAB basics - The MATLAB environment - Basic computer programming - Variables and constants, operators and simple calculations - Formulas and functions - MATLAB toolboxes
2.	Matrices and vectors - Matrix and linear algebra review - Vectors and matrices in MATLAB - Matrix operations and functions in MATLAB
3.	Computer programming - Algorithms and structures - MATLAB scripts and functions (m-files) - Simple sequential algorithms - Control structures (if…then, loops)
4.	MATLAB programming - Reading and writing data, file handling - Personalized functions - Toolbox structure - MATLAB graphic functions
5	Numerical simulations - Numerical methods and simulations - Random number generation - Montecarlo methods
6	Hands-on session Interactive hands-on-session where the whole class will develop one or more MATLAB scripts that solve an assigned problem

BERCHM3209	HUMAN VALUES & PROFESSIONAL ETHICS	1 Credit [LTP: 0-0-2]

Course Outcomes:

On successful completion of the course the learners will be able to

CO	Cognitive Abilities	Course Outcomes
CO-01	Evaluate	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
CO-02	Evaluate	Assess their own ethical values and the social context of problems
CO-03	Create	Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings.
CO-04	Apply	Implement emotional intelligence to achieve set targets and excel in interpersonal as well as intrapersonal communication.
CO-05	Create	Demonstrate knowledge of personal beliefs and values and a commitment to personal reflection and reassessment.

UNIT NO.	UNIT NAME	HOURS
1	**Introduction to Human Values**	**6**
2	**Study of Self**	**4**
3	**Introduction to Professional Ethics**	**4**
4	**Emotional Intelligence**	**6**
5	**Life Skills & Value Education**	**5**

LIST OF LABS	
1.	Human Values: Love & Compassion
2.	Truth, Non-Violence, Righteousness
3.	Peace, Service, Renunciation (Sacrifice)
4.	Self-Esteem: Do's and Don'ts to develop positive self-esteem
5.	Self-Assertiveness: Development of Assertive Personality
6.	Ambition & Desire: Self & Body (concepts & differences)
7.	Professional Ethics: Personal & Professional Ethics
8.	Emotional Intelligence: Skill Building for Strengthening the Elements of Self-awareness, Self-regulation, Internal motivation, Empathy, Social skills
9.	Governing Ethics & Ethics Dilemma
10.	Profession, Professionalism & Professional Risks
11.	Professional Accountabilities & Professional Success
12.	Life Skills & Value Education

CODE: BERCEE3601- DISCPLINE AND TALENT ENRICHMENT PROGRAMME (TEP)-III
1 Credit [LTP: 0-0-2]

OVERVIEW AND OBJECTIVES: The objective of Discipline and TEP is to provide students with the opportunities to enhance job fetching skills and at the same time to cultivate the student's personal interests and hobbies while maintaining the good disciplinary environment in the University. TEP is integrated into the curriculum for holistic development of students through active participation in various activities falling in Technical and non- technical categories.

Discipline and Talent Enrichment Programme (TEP)-III shall be evaluated irrespective of period / time allocation (as in the case of Extra Curricular activity) in the teaching scheme as a One credit course. There cord related to discipline and related activities are maintained for each student and they shall be evaluated for the same also. It shall be counted in calculation of SGP Abut it is not a backlog subject. However, the attendance of the classes shall be recorded and accounted in the total attendance.

Activities included in this category in the Third Semester are as follows:

Code	Activity	Hours	Credit
BERCEE3601	Non Syllabus Project(NSP)	1	1
	Online Certification Course	2	

Code: BERCEE4101	Electrical Circuit and Analysis	3 Credits [LTP: 3-1-0]

COURSE OUTCOMES: After Successful completion of the course students will be able to-

CO1	Define graph theory
CO2	Develop the solution of Electrical circuit using Superposition theorem, and Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem. Millman's theorem Compensation theorem, Tellegen's theorem,
CO3	Analyze the Natural response and forced response, Transient response and steady state response for arbitrary inputs (DC and AC) Evaluation of time response through classical and Laplace methods
CO4	Understand Network functions and Two Port Networks
CO5	Analyze the frequency response of circuits and to obtain the correlation between time domain and frequency domain response specifications

A. OUTLINE OF THECOURSE

UnitNo.	Title of the unit	Time required for the Unit(Hours)
1.	Graph Theory	8
2.	Network Theorems	9
3.	Transient Circuit Analysis	9
4.	Network functions and Two Port Networks	9
5.	Network Synthesis and Filters	9

B. DETAIL SYLLABUS

Unit	Unit Details
1.	**Graph Theory**
	• Introduction to unit • Graph of a network • Definitions and introduction to Tree, Co tree, Link, basic loop and basic cut-set • Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Nodal methods of analysis. • Conclusion and Summary of Unit
2.	**Network Theorems**
	• Introduction of Unit • Superposition theorem, and Thevenin's theorem • Norton's theorem, Maximum power transfer theorem, Reciprocity theorem. Millman's theorem • Compensation theorem, Tellegen's theorem, • Conclusion and Summary of Unit
3.	**Transient Circuit Analysis**

	• Introduction of Unit • Natural response and forced response • Transient response and steady state response for arbitrary inputs (DC and AC) • Evaluation of time response both through classical and Laplace methods. • Conclusion and Summary of Unit
4.	**Network Functions and Two Port Networks**
	• Introduction of Unit • Concept of complex frequency, Transform impedances network functions of one port and two port networks • Concept of poles and zeros, Properties of driving point and transfer functions. • Characterization of LTI two port networks; Z, Y, ABCD, A'B'C'D', g and h parameters • Reciprocity and symmetry, Inter-relationships between the parameters, Interconnections of two port network • Ladder and Lattice networks: T & Π representation. • Conclusion and Summary of Unit
5.	**Network Synthesis and Filters**
	• Introduction of Unit • Network Synthesis-Positive real function; definition and properties, Properties of LC,RC and RL driving point functions. • Synthesis of LC, RC and RL driving point admittance functions using Foster and Cauer first and second forms. • Filters-Image parameters and characteristics impedance, Passive and active filter fundamentals. • Low pass filters, High pass (constant Ktype) filters, Introduction to active filters. • Conclusion and Summary of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	ReferenceBook	Author	Edition	Publication
1.	Network analysis andSynthesis	Franklin F.Kuo	3rd	WileyInternational
2.	Networkanalysis	M. E. VanValkenberg	2nd	PHI
3.	Network Analysis andSynthesis	LouisWeinberg	1st	McGraw-Hill
4.	Circuits and Networks Analysis and Synthesis	Sudhakar A.Shyammohan	1st	TataMcGraw-Hill
5.	CircuitsTheory	A.Chakrawarty	2nd	Dhanpat Rai &Co.
Websites				

- www.electronicsdevices.com/;www.pearsonhighered.com
- www.mindtools.com
- www.tryscience.com
- www.khaki.com
- www.Raifoundation.org
- www.tryingineering.com
- I https://nptel.ac.in/courses/108/105/108105159/

Code: BERCEE4102	CONTROL SYSTEM	3 Credits [LTP: 3-1-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO1 Analyze the characteristic of open loop and open loop system to reduce the disturbance.

CO2 Design specifications of second order systems and evaluate their response.

CO3 Synthesize the control system components

CO4 Perform frequency domain analysis of linear control system using various frequency response methods

CO5 Construct various closed loop systems using compensation techniques in time domain and frequency domain

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Control System and Control System Components:	8
2.	Time Response analysis and Frequency response Analysis	9
3.	Digital Control Systems	9
4.	State Space Approach of Control System Analysis	9
5.	State Space Representation and Solution of State Equations	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Control System and Control System Components**
	• Introduction to unit • Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback, concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations. • Root Locus Technique: The root locus concepts, construction of rootloci • Conclusion and Summary of Unit
2.	**Time Response analysis and Frequency response Analysis**
	• Introduction of Unit • Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants • Design specifications of second order systems: Derivative error, derivative output, P-I-D Controller, applications and case studies, integral error and PID compensations, design considerations for higher order systems, performance in dices, Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots, N yquist stability criterion, Assessment of relative stability: gain margin and phase margin, constant M &N circles • Conclusion and Summary of Unit

3.	**Digital Control Systems**
	• Introduction of Unit • Sampled data control systems, signal reconstruction, difference equations. • The Z-transform, Z-Transfer Function. • Block diagram analysis of sampled data systems • Z and S domain relationship.
4.	**State Space Approach of Control System Analysis**
	• Introduction of Unit • Modern Vs conventional control theory. • Concept of state, state variable state vector, state space, state space equations. • Writing state space equations of mechanical, Electrical systems, Analogous systems • Conclusion and Summary of Unit
5.	**State Space Representation and Solution of State Equations**
	• Introduction of Unit • State Space Representation using physical and phase variables, Comparison form of system representation. • Block diagram representation of state model. Signal flow graph representation, State space representation using canonical variables, Derivation of transfer function from state-model • Diagonalization, Eigen values and Eigen vectors, Matrix exponential, State transition matrix, Properties of state transition matrix, • Computation of State transition matrix concepts of controllability & observability • Pole placement by state feedback, Ackerman's formula.

C. RECOMMENDED STUDYMATERIAL:

Sr.No	Reference Book	Author	Edition	Publicatio
1.	Control System Engineering	Nagrath &Gopal,	Latest	New age
2.	Modern Control Engineering	K.Ogata	Latest	Prentice
3.	Automatic Control System	B.C. Kuo & Fari	Latest	Wiley
4.	Modern Control Engineering	D.Roy Choudhary	Latest	Prentice Hall of
5.	Control System Engineering	Norman S.Mise,	Latest	Wiley
Websites				
□ www.electronicsdevices.com/ □ www.pearsonhighered.com □ www.khanacademic □ www.mindtools.com □ www.tryscience.com □ www.khaki.com □ www.Raifoundation.org □ www.tryingineering.com I https://nptel.ac.in/courses/108/106/108106098/				

Code: BERCCE4103	COMPUTER NETWORKS	3 Credits [LTP: 3-0-0]

COURSE OBJECTIVE & OUTCOME:

It is important for networking professionals to have a sound grounding in the basics of networking and with the networking technology being developed thick and fast, the professionals need to be updated of them at all times. The focus of this unit is providing a background to the basics of networking and its underlying principles. The learner staking this unit will explore the fundamentals of networking, the principle and purpose behind layered models, devices used in networks and their wireless connectivity and the ways to troubleshoot network related issues. This course enables learners to understand computer networking concepts, how they work, how they operate and the protocols, standards and the models associated with networking technology and their troubleshooting mechanisms. Students will develop knowledge and skills required to take up vendor certifications in the networking domain.

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO1 To Understand Networking Fundamentals

CO2 To define Basics of Network Devices

CO3 To develop Network, Transport and Application Layers

CO4 To design WAN Technology

CO5 To Apply Network Operating Systems and Troubleshooting Network

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Networking Fundamentals	8
2.	Basics of Network Devices	7
3.	Basics of Network, Transport and Application	7
4.	WAN Technology	8
5.	Network Operating Systems and Troubleshooting	6

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Networking Fundamentals**
	• Introduction of Unit • Basics of Network & Networking, Advantages of Networking, Types of Networks • Network Terms- Host, Workstations, Server, Client, Node • Types of Network Architecture- Peer-to-Peer & Client/Server, Workgroup Vs. Domain • Network Topologies, Types of Topologies, Logical and physical topologies, selecting the Right Topology • Types of Transmission Media, Communication Modes, Wiring Standards and Cabling-straight through cable, crossover cable, rollover cable, and media connectors (Fibre optic, Coaxial, and TP etc.) • Introduction of OSI model, seven layers of OSI model, Functions of the seven layers, Introduction of TCP / IP Model, TCP, UDP, IP, ICMP, ARP/RARP, Comparison between OSI model & TCP/IP model Overview of Ethernet Addresses. • Conclusion and Summary of Unit
2.	**Basics of Network Devices**
	• Introduction of Unit • Network Devices- NIC- functions of NIC, installing NIC, Hub, Switch, Bridge, Router, Gateways,And • Other Networking Devices, Repeater, CSU/DSU, and modem • Data Link Layer: Ethernet, Ethernet standards, Ethernet Components, Point-to-Point • standards, Address Resolution Protocol, Message format, transactions • Wireless Networking: Wireless Technology, Benefits of Wireless Technology • Types of Wireless Networks: Ad-hoc mode, Infra structure mode • Wireless network Components: Wireless Access Points, Wireless NICs • wireless LAN standards: IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, wireless LANmodulation • techniques • wireless security Protocols: WEP,WPA, 802.1X, Installing a wirelessLAN • Conclusion and Summary of Unit
3.	**Basics of Network, Transport and Application Layers**
	• Introduction of Unit • Network Layer: Internet Protocol (IP), IP standards, versions, functions, IPv4 addressing, IPv4 address • Classes, IPv4 address types, Subnet Mask, Default Gateway, Public & Private IP Address, methods of • assigning IP address, IPv6 address, types, assignment, Data encapsulation, The IPv4 Datagram Format, • The IPv6 Datagram Format, Internet Control Message Protocol (ICMP), ICMPv4, ICMPv6, Internet • Group Management Protocol (IGMP),Introduction to Routing and Switching concepts • Transport Layer: Transmission Control Protocol(TCP), User Datagram Protocol (UDP), Overview of • &Sockets • Application Layer: DHCP, DNS, HTTP/HTTPS, FTP, TFTP, SFTP, Telnet, Email: SMTP, • NTP • Conclusion and Summary of Unit

4.	**WAN Technology**
	• Introduction of Unit • What Is a WAN?, WAN Switching, WAN Switching techniques Circuit Switching, Packet Switching etc., • ConnectingtotheInternet:PSTN,ISDN,DSL,CATV,Satellite-BasedServices,LastMileFibre,Cellular Technologies • Connecting LANs: Leased Lines, SONET/ SDH, Packet Switching, Remote Access: Dial-up Remote Access, • VirtualPrivateNetworking,SSLVPN,RemoteTerminalEmulation,Networksecurity:Authenticationand • Authorization, Tunneling and Encryption Protocols, IP Sec, SSL and TLS, Firewall, Other Security • Appliances, Security Threats • Conclusion and Summary of Unit
5.	**Network Operating Systems and TroubleshootingNetwork**
	• Introduction of Unit • Network Operating Systems: Microsoft Operating Systems, Novell NetWare, UNIX and Linux Operating • Systems, Macintosh Networking • Trouble Shooting Networks :Command- Line interface Tools, Network and Internet Troubleshooting, Basic • Network • Troubles hooting: Troubleshooting Model, identify the affected area, probable cause, • Implement a solution, test the result, recognize the potential effects of the solution, document the solution • Using Network Utilities: ping, traceroute, tracert, ipconfig, arp, nslookup, netstat, nbtstat, Hardware trouble • Shooting tools, system monitoring tools • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	CCNA Cisco CertifiedNetwork	ToddLammle	Latest	7th Edition(Paperback),
2.	CCENT/CCNA ICND1 640-822Official	WendellOdom	Latest	3 Edition(Paperback),
3.	Routing Protocols and ConceptsCCNA Exploration Companion Guide(With	RickGraziani	Latest	Pearson,2008
4.	CCNA Exploration Course Booklet:	CiscoNetworking	Latest	Pearson,2010

Code: BEECEE4104 **ELECTRONIC DEVICES AND CIRCUITS** **3 Credits [LTP: 3-1-0]**

COURSE OUTCOMES: After Successful completion of the course students will be able-

- To understand the semiconductor devices like Diode, BJT and UJT.
- To do Analysis of Diode Circuits
- To analyze small signal parameters of transistor
- To understand the volt ampere characteristics of JFET and MOSFET
- To study and understand Oscillators and different operational amplifier

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	PN Junction Diodes	7
2.	Analysis of Diode Circuits	7
3.	Bipolar Junction Transistors (BJT)	7
4.	Field Effect Transistors	7
5.	Oscillators and Operational Amplifiers	7

B. DETAILED SYLLABUS

Unit	Unit Details
1	**PN Junction Diodes**
	• Introduction of Unit • Properties of a p–n junction • Equilibrium (zero bias) or Open-circuited p-n junction and space charge region. • Biasing of p-n junction, volt-ampere characteristics, cut in voltage and effect of temperature on V-I characteristics. • Charge carrier density distribution in (i) a forward biased junction and (ii) a reverse biased junction, diode capacitances. • Other Diodes: Avalanche breakdown and zener breakdown, working principles of zener diodes, photo-diodes, light emitting diodes, solar cell and varactor diodes. • Conclusion and Summary of Unit
2	**Analysis of Diode Circuits**
	• Introduction of Unit • Diode as a circuit element • Analysis of half wave and full wave single-phase rectifiers, filters • Voltage multipliers • Clipping and clamping circuits. • Conclusion and Summary of Unit
3	**Bipolar Junction Transistors (BJT)**
	• Introduction of Unit • Structure : P-N-P and N-P-N transistors, • Transistor current components, • Common base (CB) and common emitter (CE) configurations: input & output characteristics, current Gains: alpha , beta & gamma • Regions of operation : active region, saturation region and cutoff region, common collector configuration, BJT • biasing and DC models, thermal stability and stabilization Techniques.

	• Applications • Conclusion and Summary of Unit
4	**Field Effect Transistors**
	• Introduction of Unit • Construction of FET • FET operation: V-I characteristics and transfer characteristics of JFET. • Types of field-effect transistors • MOSFET: Enhancement type and depletion type: construction, working, V-I characteristics, and transfer characteristics. • DC analysis of FETs. FET as a voltage variable resistor. FET small signal models. FET as a switch. CMOS. • Advantages of FET over "BJT" • Conclusion and Summary of Unit
5	**Oscillators and Operational Amplifiers**
	• Introduction of Unit • Classification of oscillators and Criterion for oscillation. • RC-phase shift, Hartley, Colpitts, Wein Bridge and crystal oscillators. • Operational amplifier: inverting and non-inverting modes • Characteristics of ideal op-amp. • Basic op-amp applications: Adder , Integrator, Differentiator, comparators

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Electronic Devices and Circuits	David A. Bell	Latest	Oxford
2.	Electronic Devices and Circuit theory	Boylested	Latest	PHI
3.	Electronic Devices& Circuits	Millman & Halkias	Latest	TMH
4.	Microelectronics Circuits	A.S. Sedra, K.C. Smith	Latest	Oxford University Press
5.	Op amps and Linear Integrated Circuits	R.A. Gayakwad	Latest	Prentice Hall of India
6.	Electronic Devices and Circuits	Allen Mottershed	Latest	PHI
7.	Power Electronics Circuits, Devices and Applications	M.H.Rashid	Latest	Prentice Hall India, New Delhi
Websites				
• khanacademy.com • https://nptel.ac.in/courses/108/108/108108122/				

Code: BERECE4111 OBJECT ORIENTED PROGRAMMING 3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: The outcome of this course is to make the students well versed with the fundamentals of C++ object oriented programming language (OOP). The topics included are Introduction to JAVA, Operators & control statements, Package & Interface. OOP is the new way of approaching the job of programming. It is the most widely employed technique for developing robust, reusable software.

Students will learn the concept of algorithm design and implementation .In addition, they will write C++ codes using both console or command-line and dialog box or graphical user interface styles. Finally, students can write, compile, execute, and debug their C++programs

After Completion of course students will be able to

CO1 Study OOPS Fundamentals
CO2 Develop Programming skills in C++
CO3 Understand Java applications
CO4 Apply Operators and Control Statements in real problems
CO5 Design Package and Interfaces

A. OUTLINE OF THECOURSE

Unit	Title of the unit	Time required for the Unit(Hours)
1.	OOP Fundamentals	8
2.	Programming in C++	8
3.	Java	8
4.	Operators and Control Statements	8
5.	Package and Interfaces	8

B. DETAILED SYLLABUS

Uni	Unit Details
1.	**OOP Fundamentals**
	Introduction of Unit Concept of class and object, attributes, public, private and protected members, derived classes, single & multiple in heritance, Conclusion and Summary of Unit
2.	**Programming in C++**
	• Introduction of Unit • Enhancement sin C++ over C, Data types, operators and functions, Inline functions, constructors and destructors, Friend function, function and operator over loading, Working with class and derived classes, Single, multiple and multilevel inheritances and their combinations, virtual functions, pointers to objects, Input output flags and formatting operations. Working with text files. • Conclusion and Summary of Unit

3.	**Java**
	• Introduction of Unit • Variation from C++ to JAVA. • Introduction to Java byte code, virtual machine, application & applets of Java, integer, floating • point, characters, Boolean, literals, and array declarations • Conclusion and Summary of Unit
4.	**Operators and Control Statements**
	• Introduction of Unit • Arithmetic operators, bit wise operators, relational operators, • Boolean logic operators, operator precedence. • Switch and loop statements. • Conclusion and Summary of Unit
5.	**Package and Interfaces**
	• Introduction of Unit • Packages, access protection, importing & defining packages. • Defining and implementing interfaces. • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Publication
1.	Object Oriented Programming With C++	Sahay	--
2.	Object Oriented Programming With C++	Josuttis	Oxford
3.	An Introduction To Programming & OO Design	J. Nino & F.A.	Wiley
4.	Object Oriented Programming With C++	Shukla	Wiley
5.	OOP	TimothyBudd	Wiley
6.	Object Oriented Programming With C++	Balagurusamy	Oxford
7.	Programming With C++ (Sie) (Schaum's Outline	Hubbard	Wiley
8.	Mastering C++,	Venugopal	Wiley
9.	Programming With C++,	Ravichandran	Oxford

Websites
□ www.ima.org.uk,;www.msmath1.net/;
□ www.ima.umn.edu/;www.khanacademics.com
□ www.mindtools.com
□ www.tryscience.com
□ www.khaki.com
□ www.tryingineering.com
□ www.Raifoundation.org
□ https://nptel.ac.in/courses/106105153/

Code: BEREEE4112 OPERATING SYSTEM 3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO1 Understand concept of Operating System.

CO2 Analyze Process Management

CO3 Apply Process Management

CO4 Analyze the Storage Management.

CO5 Design Protection and Security technologies.

A. OUTLINEOFTHECOURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to Operating System	8
2.	Process Management – Processes and Threads	8
3.	Process Management – Synchronization and Deadlocks	8
4.	Storage Management	8
5.	Protection and Security	8

B. DETAILE SYLLABUS

Unit	Unit Details
1.	**Introduction to Operating System**
	• Introduction of Unit • Objectives and Functions OS • Evolution of OS, OS Structures, OS Components, OS Services • System calls, System programs, Virtual Machines. • Conclusion and Summary of Unit
2.	**Process Management – Processes and Threads**
	• Introduction of Unit • Processes: Process concept, Process scheduling, Co-operating processes, Operations on Processes, Inter process communication, Communication in client-server systems. • Threads: Introduction to Threads, Single and Multi-threaded processes and its benefits, User And Kernel threads, Multithreading models, threading issues. • CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models. • Conclusion and Summary of Unit
3.	**Process Management – Synchronization and Deadlocks**
	• Introduction ofUnit • Process Synchronization: Mutual Exclusion, Critical – section problem, Synchronization • hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OS • Synchronization, Atomic Transactions.

	• Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, • Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. • Conclusion and Summary of Unit
4.	**Storage Management**
	• Introduction of Unit • Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. • Virtual Management: Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation • File-System Interface: File concept, Access Methods, Directory structure, File-system Mounting, File sharing, Protection and consistency semantics. • File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance Recovery. • Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation • Conclusion and Summary of Unit
5.	**Protection and Security**
	• Introduction of Unit • Protection:GoalsofProtection,DomainofProtection,AccessMatrix,ImplementationofAcess Matrix,Revocation of Access Rights, Capability- Based Systems, Language – Based Protection • Security:SecurityProblem,UserAuthentication,One–TimePassword,ProgramThreats,SystemThreats,Cryptography, Computer – Security Classifications • Conclusion and Summary of Unit

C. RECOMMENDEDSTUDYMATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Operating System Concepts and Design	Milan Milonkovic	Latest	II Edition, McGraw Hill1992.
2.	Operation System Concepts	Tanenbaum	Latest	2 nd Edition, Pearson Education
3.	Operating System	Silberschatz /Galvin/Gagne	Latest	6thEdition,WSE(WILEYPublication)
4.	Operating System	William Stallings	Latest	4 th Edition, Pearson Education.

Code: BEREEE4113 ENERGY AND ENVIRONMENT MANAGEMENT 3 Credit [LTP: 3-0-0]

COURSEOUTCOMES: After Successful completion of the course students will be able to-

CO1 Analyze the Energy Auditing Techniques, methods of conducting energy audit and energy audit report.

CO2 Apply the concept of Basic Electrical Systems, Bill Analysis, Lighting Systems and Transformers and Electric Distribution

CO3 Study of Electric Motors with Motor characteristic, Motor Efficiency, losses in induction motors, factor affecting motor performance. And Compressed Air Systems

CO4 Understand Environment pollution, global warming and climate change: Air pollution (local, regional and global); Water pollution problems; Land pollution and food chain contaminations.

CO5 Create the chart natural resources, Agricultural, industrial systems and environment, Energy technologies and environment.

A. OUTLINE OF THECOURSE:

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Energy Auditing Techniques	8
2.	Basic Electrical Systems	8
3.	Electric Motors: ECO	8
4.	Environment pollution, global warming and climate	8
5.	Energy technologies and environment	8

B. DETAILEDSYLLABUS:

Unit	Unit Details
1.	**Energy Auditing Techniques**
	• Introduction of Unit • Energy Auditing Techniques: Definition, Energy audit-need, Types of energy audit, Energy management (audit) approach- understanding energy costs, Bench marking, Energy performance, Matching energy use to Requirement, Maximizing system efficiencies, optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments. , • Methodologies of Conducting Energy Audit: Preliminary & Detailed Energy Audit Methodology: Preliminary Questionnaire, Review of Previous Records, Introductory Meeting, Walk through Tour, Flow Chart Construction for Detail Energy Audit, Identification of Required Audit Instruments, Finalization of Audit Schedule with the Company, Getting Detailed Data. • EnergyAuditReport:OutlinesofEnergyAuditReportFormat,IdentificationandTechno economic • Analysis of Energy Conservation Measures, Classification of Energy Conservation Measures • Conclusion and Summary of Unit

2.	**Basic Electrical Systems**
	• Introduction of Unit • Basic Electrical Systems: Basis of Energy and its various forms: Electrical Basis-DC&AC, currents active power, reactive power and apparent power, star, delta connection. • Bill Analysis: ECO (Energy Conservation Opportunities) Electricity tariff and components, load Management & Demand Side Control, power factor improvement & its benefit, selection and location of capacitors, Performance Assessment of capacitors & Capacitor Bank. • Lighting Systems: Light source, Choice of Lighting, Luminance requirements, Energy conservation avenues. • Transformers and Electric Distribution: Types of transformers, Transformer losses, Energy efficient transformers, Factor affecting the performance of transformers and Energy Conservation Opportunities, Cables, Switch Gears, Distribution Losses, and energy conservation opportunities in-house electrical distribution system. • Conclusion and Summary of Unit
3.	**Electric Motors: ECO**
	• Introduction of Unit • Electric Motors: ECO Introduction, Types, Motor characteristic, Motor Efficiency, losses in induction motors, ,factor affecting motor performance, Motor Load Survey: Methodology, Rewinding motor and replacement issues, Energy Saving Opportunities in Motors, Motor Selection, Energy Efficient Motors, ,Speed Control of AC Induction Motors ,Soft starter with energy savers, Variable Speed Drives(VFD). • Compressed Air Systems: ECO Introduction, Types of air compressors, compressor efficiency, efficient compressor operation, compressed air systems components, capacity assessment, and leakage test, factors affecting the performance and Efficiency, energy savings opportunities. • Conclusion and Summary of Unit
4	**Environment pollution, global warming and climate change**

	• Introduction of Unit • Environment pollution, global warming and climate change: Air pollution (local, regional and global); Water pollution problems; Land pollution and food chain contaminations; Carbon cycle, greenhouse gases and global warming; Climate change–causes and consequences; Carbon footprint; Management of greenhouse gases at the source and at the sinks Ecology, • Structureandfunctioningofnaturalecosystems:Ecology,ecosystemsandtheirstructure,functionin ganddynamics; Energy flow in ecosystems; Biogeochemical cycles and climate; Population and communities • Conclusion and Summary of Unit
5.	**Energy technologies and environment**
	• Introduction of Unit • Natural resources: Human settlements and resource consumption; Biological, mineral and energy resources; Land, water and air; Natural resources vis-à-vishuman resources and technological resources; Concept of sustainability; Sustainable use of natural resources • Agricultural, industrial systems and environment: Agricultural and industrial systems visà-vis natural eco systems; Agricultural systems, and environment and natural resources; Industrial systems and environment • Energy technologies and environment: Electrical energy and steam energy; Fossil fuels, hydro power and nuclear energy; Solar energy, wind energy and biofuels; Wave, ocean thermal, tidal energy and ocean currents; Geothermal energy; Future energy sources; Hydrogen fuels; Sustainable energy □ Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1.	Bharucha, E., Textbook of Environmental	Bharucha	2nd	Universities Press
3.	Environmental Studies	Joseph,B	1st	TataMc Graw-Hill
4.	D.R.Energy Efficiency for Engineers and Technologists	Eastop, T.P. andCroft	2nd	Longman andHarow
5.	Environmental Science	Miller ,G.T	2nd	Thomson
6.	Energy Management	O'Callagan	3rd	Mc Graw Hill Book Co. Ltd
7.	Generation Of Electrical Energy Edition 2005	B.R. Gupta	1st	Eurasia Publishing House(PVT.) LTD.
Websites				

- www.khanacademics.com
- www.mindtools.com
- www.tryscience.com
- www.khaki.com
- www.tryingineering.com
- www.Raifoundation.org

Code: BERCEE4201 Control and Automation Lab 1 Credit [LTP: 0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO1	Categorize different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form.
CO2	Characterize any system in Laplace domain to illustrate different specification of the system using transfer function concept
CO3	Analyze various RC circuits and compare the results
CO4	Employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.
CO5	Formulate different order of the systems using MATLAB software

LIST OF EXPERIMENTS

1	Review of MATLAB, Introduction to MATLAB Computing Control Software, Defining Systems in TF, ZPK form.
2	(a) Plot step response of a given TF and system in state-space. Take different values of damping ratio and W natural undamped frequency. (b)Plot ramp response.
3	To design 1st order RC circuits and observe its response with the following inputs and trace the curve. (a) Step (b) Ramp (c) Impulse
4	To design 2nd order electrical network and study its transient response for step input and following cases: (a) Under damped system (b) Over damped System. (c) Critically damped
5	To Study the frequency response of following compensating Networks, plot the graph and final out corner frequencies. (a) Log Network (b) Lead Network (c) Log-lead Network.
6	DC motor characteristics, modeling using transfer function and state variable methods,
7	Position control of DC motor using PID controller
8	speed control of DC motor using pulse width modulation
9	Kinematic modeling and assembling of a differential drive automated wheeled robot,
10	Various sensors and their use in mobile robot localization and obstacle detection
11	Robot motion control and navigation

Virtual Lab- http://www.vlab.co.in/participating-institute-iit-bombay

Code: BERCCE4202	Object Oriented Programming Lab	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO1 Demonstrate class object concepts by using C++.

CO2 Develop programs using inheritance and polymorphism

CO3 Demonstrate the significance of constructors and destructor.

CO4 Implement function and operator overloading using C++

CO5 Construct generic classes using template concepts.

LIST OF EXPERIMENTS:

1.	Programs Using Functions - Functions with default arguments - Implementation of Call by Value, Call by Address and Call by Reference
2.	Simple Classes for understanding objects, member functions and Constructors - Classes with primitive data members - Classes with arrays as data members - Classes with pointers as data members – String Class - Classes with constant data members, Classes with static member functions
3.	Compile time Polymorphism - Operator Overloading including Unary and Binary Operators, Function Overloading
4.	Runtime Polymorphism - Inheritance ,Virtual functions - Virtual Base Classes, Templates - File Handling-Sequential access, Random access.

Virtual Lab-
https://cse01-iiith.vlabs.ac.in/

Code: BERCCE4203 Computer Network Lab 1 Credit [LTP: 0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO1	Recall the facts of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.
CO2	Explore Different LAN Switch Options
CO3	Configure Static and Default Routes
CO4	Plan Network-based Firewalls
CO5	Configure a Cisco Router as a DHCP Server

LIST OF EXPERIMENTS

1	Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.
2	Study of Network Devices in Detail and Study of network IP.
3	Study of basic network command and Network configuration commands.
4	Configuring and Troubleshooting a Switched Network.
5	Exploring Different LAN Switch Options.
6	Examining Network Address Translation (NAT)
7	Configuring Ethernet and Serial Interfaces
8	Configuring Static and Default Routes
9	Planning Network-based Firewalls
10	Configuring a Cisco Router as a DHCP Server

Virtual Lab- http://vlabs.iitb.ac.in/vlabs-dev/labs/oops/labs/exp1/index.php

Code: BERCCE4204 Electronic Device and Circuits Lab 1 Credit [LTP: 0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO-1: To use analog and digital multimeter, function generator, CRO and function generator.
CO-2: To analyze the V-I characteristics of PN Junction diode and Zener diode.
CO-3: To demonstrate the working rectifiers and also able to analyze the effects of the filters.
CO-4: To analyze the V-I characteristics of BJT and field effect transistor.
CO-5: To analyze the effect of change in frequency to the operation of the oscillator.

LIST OF EXPERIMENTS

1	Study the following devices: (i) Analog & digital multimeter (ii) Function/ Signal generators (iii) Regulated d. c. power supplies (constant voltage and constant current operations)
2	Study of a Digital Storage CRO and store a transient on it.
3	Study of analog CRO, CRO probes, measurement of time period, amplitude, frequency & phase angle using Lissajous figures.
4	Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse Saturation current and static & dynamic resistances.
5	Plot V-I characteristic of zener diode and study zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
6	Study half wave rectifier and effects of filters on wave. Also calculate ripple factor.
7	Study bridge rectifier and measure the effect of filter network on D.C. voltage output & ripple factor.
8	Plot drain current - drain voltage and drain current – gate bias characteristics of junction field effect transistor and measure of Idss & Vp.
9	Study Wein bridge oscillator and observe the effect of variation in R & C on oscillator frequency
10	Plot input and output characteristics of BJT in CB, CC and CE configurations.
11	To plot the characteristics of MOSFET and simulation of CMOS inverter.

Virtual Lab http://www.vlab.co.in/broad-area-electronics-and-communications

BERCHM4209	LEADERSHIP & MANAGEMENT SKILLS	1 Credit [LTP: 0-0-2]

Course Outcomes:

On successful completion of the course the learners will be able to

CO	Cognitive Abilities	Course Outcomes
CO-01	Apply	Integrate their understanding into their leadership skills development process.
CO-02	Create	Demonstrate knowledge of the working environment impacting business organizations and exhibit an understanding of ethical implications of decisions.
CO-03	Evaluate	Assess leadership styles and sharpen the managerial skills to communicate effectively and facilitate decision making in relation with self-management, stress management and conflict management.
CO-04	Create	Generate a creative thinking, something beyond the obvious answers and solution to a specific problem.
CO-05	Create	Demonstrate team skills by formulating innovative ideas with the help of brainstorming with team members.

UNIT NO.	UNIT NAME	HOURS
1	**Leadership Skills**	**4**
2	**Entrepreneurial Skills**	**4**
3	**Managerial Skills: Self –Management, Stress Management & Conflict Management**	**6**
4	**Creative Thinking & Design Thinking**	**6**
5	**Team Building & Confidence Building**	**5**

LIST OF LABS	
1.	Leadership Skills: Stages of development
2.	Leadership Skills I: Attributes of great leaders, decision making, activities to enhance such qualities
3.	Leadership Through Biographies
4.	Entrepreneurial Skills: Traits & Competencies of an Entrepreneur
5.	Managerial Skills: Conflict Management
6.	Self-Management: Challenges & Solutions
7.	Stress Management : Causes of stress and regulation
8.	Creating Business Plans: Problem Identification and Idea Generation
9.	Design Thinking: Transforming Challenges into Opportunities
10	Creative Thinking & Analytical Thinking: Presentation
11	Team building: Developing teams and team work
12	Confidence Building : Improving engagement, communicating effectively & activities to facilitate decision making

CODE: BERCEE4601- DISCPLINE AND TALENT ENRICHMENT PROGRAMME (TEP)-III
1 Credit [LTP: 0-0-2]

OVERVIEW AND OBJECTIVES: The objective of Discipline and TEP is to provide students with the opportunities to enhance job fetching skills and at the same time to cultivate the student's personal interests and hobbies while maintaining the good disciplinary environment in the University. TEP is integrated into the curriculum for holistic development of students through active participation in various activities falling in Technical and non- technical categories.

Discipline and Talent Enrichment Programme (TEP)-III shall be evaluated irrespective of period / time allocation (as in the case of Extra Curricular activity) in the teaching scheme as a One credit course. There cord related to discipline and related activities are maintained for each student and they shall be evaluated for the same also. It shall be counted in calculation of SGP Abut it is not a backlog subject. However, the attendance of the classes shall be recorded and accounted in the total attendance.

Activities included in this category in the Third Semester are as follows:

Code	Activity	Hours	Credit
BERCEE4601	Non Syllabus Project(NSP)	2	1
	Online Certification Course	1	

Code: BERCEE5101 Electrical Power Generation, Transmission and Distribution
3 Credit [LTP: 3-1-0]

COURSE OUTCOMES: After Successful completion of the course students will be able to-

CO1 Analyze Conventional and Non-conventional Energy Sources

CO2 Demonstrate the concept of Power Plant Economics.

CO3 Evaluate the Correlate Supply System & Distribution System.

CO4 Create Assess Parameters of Transmission Lines

CO5 Compute Insulators and Under Ground Cables.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Conventional and Non-conventional Energy Sources	7
2.	Power Plant Economics	9
3.	Supply System & Distribution System	10
4.	Parameters of Transmission Lines	9
5.	Insulators and Under Ground Cables	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Conventional and Non-conventional Energy Sources**
	• Introduction of Unit • Conventional Energy Generation Methods: (i) Thermal Power plants: Basic schemes and working principle. (ii) Gas Power Plants: open cycle and closed cycle gas turbine plants, combined gas & steam plants-basic schemes, (iii) Hydro Power Plants: Classification of hydroelectric plants. Basic schemes of hydroelectric and pumped storage plants. (iv) Nuclear Power Plants: Nuclear fission and nuclear fusion. Fissile and fertile materials. Basic plant schemes with boiling water reactor, heavy water reactor and fast breeder reactor. Efficiencies of various power plants. • New Energy Sources: Impact of thermal, gas, hydro and nuclear power stations on environment. Green House Effect (Global Warming). Renewable and nonrenewable energy sources • Conservation of natural resources and sustainable energy systems. Indian energy scene. Introduction to electric energy generation by wind, solar and tidal. • Conclusion and Summary of Unit
2.	**Power Plant Economics**

	• Introduction of Unit • Power Plant Economics: Capital cost of plants, annual fixed and operating costs of plants, generation cost and depreciation. Effect of load factor on unit energy cost. Role of load diversity in power system economics, Calculation of most economic power factor when (a) kW demand is constant and (b) kVA demand is constant, Energy cost reduction: off peak energy utilization, co-generation, and energy conservation. Conclusion and Summary of Unit
3.	**Supply System & Distribution System**
	• Introduction of Unit • Supply systems: Basic network of power system. Transmission and distribution voltage, effect of system Of conductor and losses. Comparison of DC 2- wire, DC 3-wire, 1-phase AC and 3-phase AC (3-wire and Systems, • Distribution Systems: Primary and secondary distribution systems, feeder, distributor and service mains. • Main distribution systems. Kelvin's law for conductor size. • Conclusion and Summary of Unit
4.	**Parameters of Transmission Lines**
	• Introduction of Unit • Parameters of Transmission Lines: Resistance inductance and capacitance of overhead lines, effect of earth, line transposition. Geometric mean radius and distance • Inductance and capacitance of line with symmetrical and unsymmetrical spacing Inductance and capacitance of double • circuit lines. Skin and proximity effects. Equivalent circuits and performance of short and medium transmission lines. • Generalized ABCD Line Constants: equivalent circuit and performance of long transmission line. Ferranti effect. • Interference with communication circuits. Power flow through a transmission line, Corona Effects and solution • Conclusion and Summary of Unit
5.	**Insulators and Under Ground Cables**
	• Introduction of Unit • Insulators: Pin, shackle, suspension, post and strain insulators. Voltage distribution across an insulator Methods of improving string efficiency. • Underground Cables: Conductor, insulator, sheathing and armoring materials. Types of cables. Insulator • Capacitance calculation. Electrostatic stresses and reduction of maximum stresses. Causes of breakdown. of cable. • Introduction to oil filled and gas filled cables. • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Generation of Electrical Energy (4/e)	B. R.Gupta	Latest	S. Chand Publication
2.	Electrical Power(13/e)	S. L.Uppal	Latest	Khanna Publishers
3.	Electric Power Transmission and Distribution,	S.Sivanagaraju andS Satyanarayan	Latest	Pearson Publisher.
4.	: Electric Power Distribution	A. S.Pabla	Latest	MGH.

Code: BERCEE5102 MICROPROCESSORANDMICROCONTROLLER 3 Credits [LTP:3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO1 Analyze microprocessor and microcontroller

CO2 Create data transfer instructions, arithmetic instructions, and Logical instructions in microprocessor.

CO3 Understand the Fundamental of I /O, Programmed and interrupt I/O, parallel communication interface for 8086 microprocessor

CO4 Apply the DMA process, 8257 DMA controller with operation and programming in The 8051 Microcontroller.

CO5 Design the assembly language code using 8051 microprocessor

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Introduction to Microprocessor	8
2.	Assembly language programming	9
3.	I/O Programming and Real-Time	8
4.	Peripheral Interfacing and Programming	8
5.	The 8051Microcontroller	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Microprocessor**
	• Introduction of Unit • Microprocessor evolution and development. • System buses and operation. • 8085microprocessor:Architecturel • Conclusion and Summary of Unit
2.	**Microprocessor Architecture and System Bus**
	• Introduction of Unit • Instruction set, data transfer instructions, arithmetic instructions, Logical instructions, shift and rotate instructions. Branch instructions, flag manipulation instructions, addressing modes, Assembly language programming, Conclusion and Summary of Unit
3.	**Instructions of 8086 and Assembly Language**
	• Introduction of Unit • Fundamental of I/O, Programmed and interrupt I/O, parallel communication interface. • The 8255PPI chip: Architecture, Functional description of various pins, modes of operations and programming examples, ADC and DAC interfacing with microprocessor and real-time applications • Conclusion of Unit
4.	**The 8051 Microcontroller**

	• Introduction of Unit • Introduction to DMA process, 8257 DMA controller with operation and programming, programming examples using 8254 timer chip in different mode of operation. • Serial communication interface and programming using 8251(USART), Interrupt process, In • Priority management using single and multiple of 8259 chip, Keyboard interface8279 • Conclusion of Unit including real life application.
5.	**8051 Assembly Language Programming**
	• Introduction of Unit • The 8051microcontroller hardware, I/O pins, Port, External memory • Counters and Timers • Serial data Interrupt • Real life applications • Conclusion of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Microprocessor Architecture, Programming and Application	Ramesh S.Gaonkar	Penram Publication	Microprocessor Architecture, Programming and
2.	Advanced Microprocessors and Peripherals	Ray and Bhurchandi	TataMcGraw-Hill	Advanced Microprocessors and Peripherals
3.	An Introduction to Intel family of Microprocessor	Antonakos	Pearson Education	An Introduction to Intel family of Microprocessor
4.	Micro computer System	Liu and Gibson	PHI	Micro computer System
5.	Microprocessors And Microcontrollers	Senthil	Oxford	Microprocessors And
6.	The8051Microcontroller and Embedded Systems	Mazidiand Mazidi	Pearson Education	The 8051 Microcontroller and Embedded Systems
7.	The 8051Microcontroller	Kenneth	Thomson	The 8051Microcontroller
8.	Microprocessor Architecture, Programming and	Ramesh S. Gaonkar	Penram	Microprocessor Architecture,
Websites				
I https://nptel.ac.in/courses/108/107/108107142/ I https://nptel.ac.in/courses/108/103/108103157/				

Code BERCEE5103	Power Electronics and Drives	3 Credits [LTP:3-1-0]

COURSEOUTCOMES: After Successful completion of the course students will be able to-

CO1 Analyze the Characteristics of Power Transistor, Thyristor, GTO, Power MOSFET and IGBT.

CO2 Illustrate the working and applications of power converters.

CO3 Design the boost convertor for DC-DC conversion

CO4 Analyze Dynamics of Electric Drives

CO5 Illustrate the AC Drives.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Power Semiconductor Devices and SCR	7
2.	Converters	9
3.	DC-DC Converters: Choppers	10
4.	Dynamics of Electric Drives	9
5.	AC Drives	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Power Semiconductor Devices and SCR**
	• Introduction of Unit • Characteristics of Power Transistor, Thyristor, GTO, Power MOSFET and IGBT Two-Transistor Model of Thyristor. • Construction and characteristics, specification and ratings, pulse transformer, optical isolators, • Methods of turn on: R,RC, UJT relaxation oscillator • Rating extension by series and parallel connections, string efficiency • Protection of SCR-Protection against over voltage, over current, dv/dt, di/dt, Gate protection • Conclusion and Summary of Unit
2.	**Converters**
	• Introduction of Unit • Single phase half & full wave converters with RL load, Single phase dual converters • Three phase half wave converters, Three phase full converters with RL load, Three phase dual converters • Single and three-phase semi converters with RL load • Power Factor Improvement Extinction angle control, symmetrical angle control, pulse width modulation control and sinusoidal pulse width modulation control • Inversion operation. Effect of load and source impedances • Conclusion and Summary of Unit
3.	**DC-DC Converters: Choppers**

	• Introduction to unit • Step Up/Down Copper, Chopper Configuration • Analysis of type A Chopper Commutation of Choppers • Switched Mode Regulators-buck, boost, buck-boost and cuk regulator • Conclusion and Summary of Unit
4.	**Dynamics of Electric Drives**
	• Introduction of Unit • Dynamics of Electric Drives: Fundamental torque equations, speed-torque conventions and multi quadrant operation, Nature and classification of load torques, steady state stability, load equalization, close loop configurations of drives. • DC Drives: Speed torque curves, torque and power limitation in armature voltage and field control, Starting, Braking: Regenerative Braking, dynamic braking and plugging. Speed Control-Controlled Rectifier fed DC drives, Chopper Controlled DC drives. • Conclusion and Summary of Unit.
5.	**AC Drives**
	• Introduction of Unit • Induction Motor Drives-II: Variable frequency control from current source, Current Source Inverter (CSI) Control, Cycloconverter Control, Static rotor resistance control, Slip Power Recovery- Stator Scher bias drive, Static Kramer drive. • Synchronous Motor Drive: Control of Synchronous Motor-Separately Controlled and VSI fed Self-Controlled Synchronous Motor Drives. Dynamic and Regenerative Braking of Synchronous Motor with VSI. Control of Synchronous Motor Using Current Source Inverter (CSI). • Conclusion and Summary of Unit.

C. RECOMMENDED STUDYMATERIAL:

Sr . No	Reference Book	Author	Editio	Publication
1.	Power Electronics, Circuits Devices and Applications	M H Rashid	3	PHI
2.	Power Electronics	NedMohan	3	John Wiley
3.	Power Electronics	M D Singh Khan chandani	2	TMH
4.	Elements of Power Electronics	Krein P.T	2	Oxford
5.	Power Electronics	P C Sen	3	TMH
Websites				
I https://nptel.ac.in/courses/108/105/108105066/ https://nptel.ac.in/courses/108101038/				

Code-BERCEE5104 Artificial Intelligence & Expert System 3 Credits [LTP:3-0-0]

OBJECTIVE: To present the concepts of intelligent agents, searching, knowledge and reasoning, planning, learning and expert systems

COURSEOUTCOMES: After Successful completion of the course students will be able to-

CO1 Discriminate the idea of intelligent agents and search method

CO2 Summarize about representing knowledge

CO3 Justifie the reasoning and decision making in uncertain world.

CO4 Construct plans and methods for generating knowledge.

CO5 Apply the concepts of expert systems in real problems.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to AI	7
2.	Knowledge and Reasoning	9
3.	Uncertain Knowledge and Reasoning	10
4.	Planning and Learning	9
5.	Expert Systems	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to AI**
	• Introduction of Unit • Introduction to AI: Intelligent agents – Perception • Natural language processing – Problem Solving agents • Searching for solutions: Uniformed search strategies • Informed search strategies. • Conclusion and Summary of Unit
2.	**Knowledge and Reasoning**
	• Introduction of Unit • Adversarial search , Optimal and imperfect decisions, Alpha, Beta pruning • Logical agents: Propositional logic, First order logic – • Syntax and semantics using first order logic, Inference in first order logic. • Conclusion and Summary of Unit
3.	**Uncertain Knowledge and Reasoning**
	• Introduction to unit • Uncertainty, Acting under uncertainty • Basicprobabilitynotation,Axiomsofprobability,Baye'srule,Probabilisticreasoning,Makingsimpled

	• Conclusion and Summary of Unit
4.	**Planning and Learning**
	• Introduction of Unit • Planning: Planning problem, Partial order planning, Planning and acting in non-deterministic domains • Learning: Learning decision trees, Knowledge in learning, Neural networks, Reinforcement learning, Passive and active • Conclusion and Summary of Unit.
5.	**Expert Systems**
	• Introduction of Unit • Definition: Features of an expert system, Organization, Characteristics, Prospector • Knowledge Representation in expert systems, Expert system tools, MYCIN,EMYCIN • Conclusion and Summary of Unit.

C. RECOMMENDED STUDYMATERIAL:

Sr.No	ReferenceBook	Author	Edition	Publication
1.	Artificial Intelligence A Modern Approach	Stuart Russel and Peter Norvig	2	PHI
2.	A Guide to Expert Systems	Donald A.Waterman	latest	Pearson Education
3.	Artificial Intelligence–Structures and Strategies for Complex Problem Solving	George F.Luger	4	Pearson Education
4.	Artificial Intelligence	Elain Rich and Kevin	2	TMH
5.	Introduction to Artificial Intelligence and Expert Systems'	W.Patterson	latest	Prentice Hall of India

Code: BERCEE5105	Electric Vehicle Technology	3 Credits [LTP: 3-0-0]

COURSEOUTCOMES:: After Successful completion of the course students will be able-

CO1 To classify the basics of electric and hybrid electric vehicles and fundamentals.

CO2 To analyze the working of different electrical machines in hybrid electric vehicles.

CO3 To identify the different energy storage systems used for hybrid electric vehicles and able to select appropriate energy balancing technology

CO4 To classify and describe energy management strategies and challenges.

CO5 To implement the policies and standards for EV systems.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Introduction to Hybrid Electric Vehicle	7
2.	Electric Drives	9
3.	Energy Storage	10
4.	Energy Management System	9
5.	Mobility and Connectors	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Introduction to Hybrid Electric Vehicle**
	• Introduction of Unit • Radix and Radix conversions, sign, magnitude & complement notation. • Weighted and non-weighted codes, BCD codes, self-complementing codes, • Cyclic codes, error detecting and correcting codes • ASCII & EBCDIC codes. BCD arithmetic. • Conclusion and Summary ofUnit
2.	**Electric Drives**
	• Introduction of Unit • Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains, • Electric Propulsion unit, Configuration and control of DC Motor drives, Induction Motor drives, • Permanent Magnet Motor drives, switched reluctance motor • Conclusion and Summary of Unit
3.	**Energy Storage**

	• Introduction of Unit • Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles:- • Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices. • Sizing the drive system, Design of Hybrid Electric Vehicle and Plug-in Electric Vehicle, • Conclusion and Summary of Unit
4.	**Energy Management System**
	• Introduction of Unit • Energy Management Strategies, Automotive networking and communication, • EV charging standards, V2G, G2V, V2B,V2H. • Business: E-mobility business, electrification challenges, Business- E-mobility business, • Electrification challenges, • Conclusion and Summary of Unit
5.	**Mobility and Connectors**
	• Introduction of Unit • Connected Mobility and Autonomous Mobility- case study E mobility Indian Road map Perspective. • Policy: EVs in infrastructure system, integration of EVs in smart grid, social dimensions of EVs. • Connectors- Types of EV charging connector, North American EV Plug Standards, DC Fast Charge EV • Plug Standards in North America, CCS (Combined Charging System), CHA de MO, Tesla, European EV Plug Standards, • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Vehicular Electric Power Systems	Emadi,A.(Ed.), Miller,J., Ehsani,M.	Latest	CRC Press,
2.	Electric and Hybrid Vehicles	Husain,I	Latest	CRC Press
3.	"Electric Vehicle Technology Explained	Larminie, James, and John Lowry	Latest	John Wiley and Sons,
4.	The automobile, In Electric Vehicles: Prospects and Challenges	Tariq Muneer and IreneI llescas García	Latest	Elsevier
5.	Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles	Sheldon S.Williamson	Latest	Springer
Websites				
https://nptel.ac.in/courses/108106170				

Code: BEREEE5111 SOLAR THERMAL AND PV 3 Credits [LTP: 3-0-0]

COURSEOUTCOMES: After Successful completion of the course students will be able to-

CO1 Discover various Renewable energy resources and their scenario

CO2 Explore solar and thermal energy conversion schemes

CO3 Analyze and discuss photovoltaic energy harvesting system

CO4 Design the charge controllers for PV system in extracting maximum power from the PV

CO5 Develop an efficient PV system for betterment of society

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction of Renewable Energy	8
2.	Solar energy and solar Thermal concepts	8
3.	Solar PV (Photovoltaic) &PV Modules	8
4.	Charging Controllers	8
5.	PV System design (Calculation) and its applications & Business Tips	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction of Renewable Energy**
	• Introduction of Unit • Conventional types of energy (Hydro, Atomic, Thermal, etc.) used in World/India Existing energy resource is limited & not environment friendly. • Types of renewable energy or green energy, Solar energy, Biomass and Wind Energy • Conclusion and Summary of Unit
2.	**Solar energy and solar Thermal concepts**
	• Introduction of Unit • Thermal and PV. • Difference between Thermal & PV • Types (ETC and FPC) & Working Principle • Conclusion and Summary of Unit
3.	**Solar PV (Photovoltaic) & PV Modules**

	• Introduction of Unit • Latitude, Longitude & Tilt angle basic • Atmospheric effects on Solar PV energy. • Angle calculation. • Solar cell manufacturing. • Types of Solar Cells Crystalline Monocrystalline Poly/Multicrystalline Thin Film Concentrating Photovoltaic Panel (Modules) specification :-Watts, VOC ,ISC,V-Nominal voltage, WP, V-Max ,I-Max • Conclusion and Summary of Unit
4.	**Charging Controllers**
	• Introduction of Unit • Specification, Working Functions Types MPPT vs. PWM • Charge Controller ratings ,Circuit diagram • Solar Invertors & Batteries and DC load • Conclusion of Unit including real life application
5.	**PV System design (Calculation) and its applications & Business Tips**
	• Introduction of Unit • Load calculation • Panel selection (Volts / Watts & no. of panels) and Charge controller selection Battery pack selection (Volts / AH & no. of Batteries) and Inverter selection (Volts / VA selection • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Expert Handbook for Planning, Design and Installation	NA	NA	Earthscan Ltd
2.	Solar Water and Pool Heating Manual	NA	NA	Florida Solar Energy Center
3.	Planning and Installing Solar Thermal Systems:A Guide for Installers,	NA	NA	Kindlee Book

Websites

- https://nptel.ac.in/courses/103107157/
- https://nptel.ac.in/courses/112105051/

Code:BEREEE5112 HYDROGEN ENERGYAND FUEL CELL 3.0 Credits[LTP:3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able to -

- Discriminates hydrogen production methods.
- illustrates how to store hydrogen
- Designs Learn working principle of fuel cells.
- Demonstrates be familiar with fuel cell types.
- Concludes the applications of all the areas in day to day life.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Introduction to hydrogen energy	7
2.	Hydrogen Safety And application	9
3.	Introduction to fuel cells	1
4.	Fuel Cell components	9
5.	Applications Of Fuel cells	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Fundamentals Of HVAC**
	• Introduction of Unit • Hydrogen Energy- Properties of hydrogen as fuel, Electrolytic and thermo-chemical hydrogen production–Metal hydrides-Hydrogen energy conversion systems: hybrid systems–Economics and technical feasibility. Hydrogen as an alternative fuel in IC engines; Suitability of Hydrogen as a fuel, Conclusion and Summary of Unit
2.	**Hydrogen Safety And application**
	• Introduction of Unit • Hydrogen safety aspects-Back fire, pre-ignition, hydrogen emission NOx control techniques and strategies, Hydrogen fuel for transport. Hydrogen powered vehicles. Application, General introduction to infrastructure requirement for hydrogen production, storage, dispensing &utilization. • Conclusion and Summary of Unit
3.	**Introduction to Fuel Cells**

	• Introduction of Unit • Introduction–working and types of fuel cell–low, medium and high temperature fuel cell, liquid and methanol types, protonex change membrane fuel cell solid oxide, hydrogen fuel cells–thermodynamics and electrochemical kinetics of fuel cells, comparison on battery Vs fuel cell, • Conclusion and Summary of Unit
4.	**Fuel Cell Components And Their Impact On Performance**
	• Introduction of Unit • Fuel cell performance characteristics–current/ voltage, voltage efficiency and power density, ohmic resistance, kinetic performance, mass transfer effects–membrane electrode assembly components, fuel cells tack, bi-polar plate, humidifiers and cooling plates. • Conclusion and Summary of Unit
5.	**Applications Of Fuel Cells**
	• Introduction of Unit • Fuel cells applications–Fuel cell usage for domestic power systems, portable fuel cells, technology advances in fuel cell vehicle systems–on board hydrogen storage–liquid hydrogen and compressed hydrogen–metal hydrides, fuel cell control system – alkaline fuel cell – road map to market • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Non-Conventional Energy Resources	B.H.Khan	3rd	Tata Mc Graw Hill
2.	Renewable Energy Sources and Emerging Technologies	D. P.Kothari	2nd	PHI Learning
3.	Principles of fuel cells Planning and Installing Solar Thermal Systems: A Guide for Installers, Architects and Engineers	Liu,H	NA	Taylor &Francis
Websites				
□ https://nptel.ac.in/courses/103102015/ □ https://nptel.ac.in/courses/103107157/ □ https://nptel.ac.in/courses/112105051/				

Code: BEECEE5113 SWITCHGEAR AND PROTECTION OF POWER SYSTEM 3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

- To understand knowledge in the Static Relays ,Comparators & Static over Current .
- To apply Carrier Current Protection & Distance Protection.
- To understand working and applicarions of Circuit Breakers II & Digital Protection .

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Static Relays ,Comparators & Static over	8
2.	Static Differential Relays & Static Distance	9
3.	Carrier Current Protection & Distance	9
4.	Circuit Breakers I	9
5.	Circuit Breakers II & Digital Protection	9

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Static Relays ,Comparators & Static over Current**
	• Introduction of Unit • Introduction to static relays, merits and demerits. • Comparators: amplitude and phase comparators, duality between amplitude and phase comparators. Introduction to (a) amplitude comparators- circulating current type, phase splitting type and sampling type, (b) phase comparators-vector product type and coincidence type. • Static over Current Relays: Introduction to instantaneous, definite time, inverse time and directional overcurrent relays. • Conclusion of Unit including real life applications
2.	**Static Differential Relays & Static Distance Relays**
	• Introduction of Unit • Brief description of static differential relay schemes- single phase and three phase schemes. • Introduction to static differential protection of generator and transformer. • Static Distance Relays: Introduction to static impedance, reactance and mho relays. • Conclusion of Unit including real life applications
3.	**Carrier Current Protection & Distance Protection**
	• Introduction of Unit • Carrier Current Protection: Basic apparatus and scheme of power line carrier system • Principle of operation of directional comparison and phase comparison carrier protection and carrier assisted distance protection. • Distance Protection: Effect of power swings on the performance of distance protection • Out of step tripping and blocking relays, mho relay with blinder • Introduction to quadrilateral and elliptical relays. • Conclusion of Unit including real life applications

4.	**Carrier Current Protection & Distance Protection**
	• Introduction of Unit • Electric arc and its characteristics, arc interruption- high resistance interruption and current zero interruption. • Arc interruption theories– recovery rate theory and energy balance theory. • Restriking voltage an d recovery voltage, develop expressions for restriking voltage and RRRV • Resistance switching, current chopping and interruption of capacitive current. • Oil circuit breakers-bulk oil and minimum oil circuit breakers & Air circuit breakers. • Conclusion of Unit including real life applications..
5.	**Circuit Breakers II & Digital Protection**
	• Introduction of Unit • Air blast, SF6 and vacuum circuit breakers. Selection of circuit breakers, rating of circuit breakers • Digital Protection: Introduction to digital protection. Brief description of block diagram of digital relay • Introduction to digital overcurrent, transformer differential and transmission line distance protection. •

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Switchgear and Protection	S. S. Rao	Latest	Khanna Publishers
2.	Power system Protection and Switchgear	B. Ravindranath and M. Chande	Latest	Wiley
3.	Fundamentals of Power System Protection	Y. G. Paithankar and S R Bhide	Latest	PHI
4.	Power System Protection: Static Relays with Microprocessor Application	T.S.M Rao	Latest	Tata Macgraw Hill
5.	Protective Relays- Their Theory and Practice, Vol. I & II	A.R. Van C. Warringtaon	Latest	Jhon Willey & Sons
Websites				
• https://nptel.ac.in/courses/108101039/ • https://nptel.ac.in/content/storage2/courses/108101039/download/Lecture-1.pdf				

Code: BERCEE5201 Micro Processor and Micro Controller Lab 1 Credits [LTP: 0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO1 Apply and analyze the memory structure and operation of 8085-Microprocessor and integer division: (1) 8-bit by 8-bit (2) 16 bit by 8 bit, integer division: (1) 8-bit by 8-bit (2) 16 bit by 8 bit

CO2 Examine the Sorting of array, finding party of a 32-bit number.

CO 3 Analyze the conversion (1) BCD to ASCII (2) BCD to hexadecimal, multiply two 8 bit numbers and generate and sum15 Fibonacci numbers

CO4 Analyze for rolling display of massage" india", insert a number at correct place in a sorted array, Reversing bits of an8-bitnumber. Fabrication of 8-bit LED i I interfaces for 8085 kit through

CO5 Design a code for display addition application.

LIST OFEXPERIMENTS

1.	Study the hardware, functions, memory structure and operation of 8085-Microprocessor kit.
2.	Program to perform integer division: (1) 8-bit by 8-bit (2) 16 bit by 8 bit.
3.	Transferofablockofdatainmemorytoanotherplaceinmemory,Transferofblacktoanotherlocationin
4.	Sorting of array in: (1) Ascending order (2) Descending order.
5.	Finding party of a 32-bit number.
6.	Program to perform following conversion (1) BCD to ASCII (2) BCD to hexadecimal.
7.	Program to multiply two 8 bit numbers
8.	Program to generate and sum 15 Fibonacci numbers.
9.	Program for rolling display of massage" india", "hello".
10.	To insert a number at correct place in a sorted array, Reversing bits of an 8-bit number. Fabrication of 8-bit LED interfaces for 8085 kit through 8155 and 8255.

Virtual Lab-http://vlabs.iitb.ac.in/vlabs-dev/labs_local/microprocessor/labs/explist.php

Code: BERCEE5202	Power Electronics & Drives Lab	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO1	Able to Elucidate the basic operation of various power semiconductor devices and passive components
CO2	Analyze various power electronics circuits and their applications
CO3	Competency in function of various power electronics devices
CO4	Examine the performance of the various power electronic circuits
CO5	Design and implement basic power electronic circuits in the laboratory

LIST OFEXPERIMENTS

1.	Study the comparison of following power electronics devices regarding ratings, performance characteristics and applications: Power Diode, Power Transistor, Thyristor, Diac, Triac, GTO, MOSFET, MCT and SIT.
2.	Determine V-I characteristics of SCR and measure forward break down voltage, latching and holding currents.
3.	Find V-I characteristics of TRIAC and DIAC. Find out put & transfer characteristics of MOSFET and IGBT.
4.	Study and test 3-phase diode bridge rectifier with R and RL loads. Study the effect of filters.
5.	Study and obtain wave forms of single phase half and full wave controlled rectifier with and without filters.
6.	Study and obtain wave forms of single-phase half and full wave controlled bridge rectifier with R and RL loads. Study and show the effect of freewheeling diode.
7.	Control speed of dc motor using 3-phase (a) half controlled (b) full controlled bridge converter. (c) Plot armature voltage versus speed characteristic
8.	Control speed of a 3-phase induction motor in variable stator voltage mode using 3-phase AC voltage regulator
9.	Study three-phase Cyclo-converter and speed control of synchronous motor using Cyclo-converter.
10.	Control of 3-Phase Induction Motor in variable frequency V/f constant mode using 3-phase inverter

Virtual Lab- http://www.vlab.co.in/broad-area-electrical-engineering,https://www.iitk.ac.in/new/power-electronics-laboratory

Code: BERCEE5203	switchgear & Protection Lab	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

LIST OFEXPERIMENTS

1.	Determination of drop out factor of an instantaneous over current relay.
2.	Determination of operating characteristics of IDMT relay.
3.	Determination of operating characteristics of differential relay.
4.	Study and operation of gas actuated protective relay.
5.	Study of Static Over current relay
6.	Determination of transmission line parameters using MATLAB
7.	Analysis of power system faults (Symmetrical & Asymmetrical) using MATLAB
8.	Study of SF6 circuit breaker
9.	Protection Simulation study of Generator, Transformer, motor and feeder.
10.	Determination of dielectric Strength of transformer oil.

BERCHM5209	PROFESSIONAL SKILLS-I	1 Credit [LTP: 0-0-2]

Course Outcomes:

On successful completion of the course the learners will be able to

CO	Cognitive Abilities	Course Outcomes
CO-01	Evaluate/Create	Compare the professional and personal approach towards any task and demonstrate their understanding by displaying professional attitude in the assigned tasks.
CO-02	Evaluate	Choose appropriate formal elements of specific genres of organizational communication to be used in reports, proposals, memorandums, web pages, wikis, blogs, business letters, and promotional documents etc.
CO-03	Create	Design a clear and fluent demonstrative, informative, and persuasive presentation and enlarge their vocabulary by keeping a vocabulary journal.
CO-04	Create	Demonstrate preparedness for any type of interview from classic one-on-one interview to panel interviews, Phone/Skype interviews, Behavioral/Situational etc.
CO-05	Create	Construct principled negotiations that result in wise agreements and achieve win-win outcomes.

UNIT NO.	UNIT NAME	HOURS
1	**Professional Attitude & Approach**	**4**
2	**Professional Writing-I**	**6**
3	**Presentation Skills: Structure Study**	**4**
4	**Interview Skills & Group Discussion**	**6**
5	**Negotiation Skills & Time Management**	**5**

LIST OF LABS	
1.	Professional & Ethical Approaches : Degree of adherence, Business world & meeting deadlines
2.	Job Hunting and Networking: Skill Branding & Usage of Online Platforms
3.	Trust Building & Cultural Etiquettes
4.	Professional Writing-I: Direct-Indirect approaches to Business Writing-Five main stages of writing Business Messages.
5.	Professional Email Writing
6.	Resume Building-I: Difference between C.V. & Resume, formats, points to cover, practice sessions
7.	E-Learning & E-Content Development-I
8.	Presentation Skills: format & structure of presentations, using tools & techniques
9.	Job Interviews I: Preparation and Presentation
10.	Advanced Group Discussion – I
11.	Negotiation Skills & and Conflict Resolution-I
12.	Professional Code of Ethics & Effective Time Management

BERCHM5210	COMMUNICATION SKILLS-I	1 Credit [LTP: 0-0-2]

Course Outcomes:

On successful completion of the course the learners will be able to

CO	Cognitive Abilities	Course Outcomes
CO-01	Create	Depict barriers to effective interpersonal communication and formulate appropriate strategies to resolve these issues.
CO-02	Analyze	Outline the self-concept development process, its multidimensional identity and its role in communication.
CO-03	Evaluate	Determine listening habits and practice effective listening skills.
CO-04	Create	Develop and expand Writing Skills through controlled and guided activities.
CO-05	Create	Develop, practice and acquire the skills necessary to deliver effective, presentation with clarity and impact

MODULE/UNIT OUTCOMES:	
Module/Unit 1: Intrapersonal/Interpersonal Skills Students will be able to	
Interpret their personality and learn how to adapt their behavior and communicate effectively with others for each scenario.	Apply
Demonstrate the qualities of interpersonal skills and intrapersonal skills for personal and team effectiveness.	Apply

Module/Unit 2: Reading Skills Students will be able to	
Illustrate and appreciate language enrichment by examining an author's choice of words, the use and effect of simple figurative language, vocabulary and language patterns, and images, as appropriate to the text	Understand
Compare the ways in which different literary, digital and visual genres and sub-genres shape texts and shape the reader's experience of them	Understand

Module/Unit 3: Writing Skills Students will be able to	
Show the ability to use the conventions of grammar when creating paragraphs.	Apply
Examine different audiences and purposes for writing to develop situational based content.	Apply

Module/Unit 4: Listening Skills Students will be able to	
Apply their listening skills actively to comprehend and communicate the responses.	Apply
Understand barriers to listening and implement more effective active listening patterns.	Understand

Module/Unit 5: Speaking Skills Students will be able to	
Discover strategies for choosing a topic and identify a purpose and thesis of the speech.	Apply
Identify the particular challenges of engaging an audience and develop confidence in speaking.	Apply

UNIT NO.	UNIT NAME	HOURS
1	**Intrapersonal/Interpersonal Skills**	6
2	**Reading Skills**	4
3	**Writing Skills**	6
4	**Listening Skills**	4
5	**Speaking Skills**	5

LIST OF LABS	
1.	Self – Awareness & Self-Introduction
2.	Goal Setting: Ambition induced, interest induced or environment conditioned
3.	Cultivating Conversational Skills
4.	Role Plays : Selection of varied plots, characters & settings
5.	Reading skills I: Newspaper Reading & General Article Reading
6.	Writing Skills I: Story Making by jumbled words
7.	Understanding and Applying Vocabulary
8.	Listening Skills I: Types and practice by analyzing situational listening
9.	Speaking Skills I: JAM
10.	PowerPoint Presentation Skills-I
11.	Telephonic Etiquettes and Communication
12.	Recognizing, understanding and applying communication style (Verbal/Non-Verbal)

CODE:BERCEE5401	TECHNICAL SEMINAR	6 Credit [LTP: 0-0-3]

OBJECTIVE: -

- To practice various activities involved in seminar talk–gathering information, preparation of slides, discussion, reporting.
- To develop the communicative and writing skills in technical reporting

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO1	Inspect a given engineering problem identifies an appropriate problem solving methodology, implement the methodology and propose a meaningful solution.
CO2	Identify sources of hazards, and assess / identify appropriate health & safety measures.
CO3	Compose the work in a team.
CO4	Design and manage a project within a given timeframe.
CO5	Adopt and develop a factual approach to decision making.

GUID LINES FOR SEMINAR:

1. Every student will individually study a topic assigned to him/ her and submit a report and shall deliver a short lecture/ Seminar on the topic attended of term.

2. Selection of topic should be done by students in consultation with concerned guide

- Topic should be related to branch but it should be extended part of the branch (latest and advance topic).
- The topic should be such that the student can gain latest knowledge. Student should preferably refer at least one research paper

3. Seminar topic should not be repeated in the department and registration of the same should be done on first come first served basis.

4. Seminar report should be submitted in paper bound copy prepared with computer typing

a).Size of report depends on advancement of topic.

b). Student should preferably refer minimum 5 reference books / magazines.

c).Format of content

i. Introduction. ii. Literature survey. iii. Theory

1) Implementation 2) Methodology 3) Application 4) Advantages, Disadvantages 5) Future Scope 6) Conclusion

CODE: BERCEE5601 DISCPLINE AND TALENT ENRICHMENT PROGRAMME (TEP)-VI 1CREDIT

OVER VIEW AND OBJECTIVES:

The objective of Discipline and TEP is to provide students with the opportunities to enhance job fetching skills and at the same time to cultivate the student's personal interests and hobbies while maintaining the good disciplinary environment in the University. TEP is integrated in to the curriculum for holistic development of students through active participation in various activities falling in Technical and non-technical categories.

Discipline and Talent Enrichment Programme (TEP)–V shall be evaluated irrespective of period / time allocation (as in the case of Extra Curricular activity) in the teachings Scheme as a One credit course. There cord related to discipline and related activities are maintained for each student and they shall be evaluated for the same also. It shall be counted in calculation of SGPA but it is not a backlog subject. However, the attendance of the classes shall be recorded and accounted in the total attendance.

Activities included in this category in the Third Semester are as follows:

CODE	ACTIVITY	HOURS	CREDITS
BERCEE5601	CRT	2	1
	Online Certification Course	1	

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Code: BERCEE6301	MINOR PROJECT	1 Credits [LTP: 0-0-2]

LABOUTCOMES: After Successful completion of the lab students will be able to-

CO1 Predict a problem of current relevance to society

CO2 Formulate the problem and identify suitable modeling paradigm

CO3 Categorize the problem and identify the solution methodology

CO4 Simulate and design systems using various modern tools

CO5 Validate the results and prepare a project report

GUIDELINES FOR MINOR PROJECT:

1. Every student individually or in a group (group size is of 4students. However, if project complexity demands a maximum group size of 5 students, the committee should be convinced about such complexity and scope of the work.) Shall take a project in the beginning of the seventh term in consultation with the guide and the project must be completed in the eighth term.
2. The project proposal must be submitted in the institute in the beginning of the seventh term. While submitting project proposal carries to be taken that project will be completed within the available time of two term. The final title of the project work should be submitted at the beginning of eighth semester.
3. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.
4. The group is expected to complete details system design, layout etc. in seventh term, as apart of term work in the form of a joint report. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
5. One guide will be assigned at the most three project groups.
6. The guides should regularly monitor the progress of the project work.
7. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.
8. The guide should be internal examiner for oral examination (If experience is greater than three years).
9. The external examiner should be from the related area of the concerned project. He should have minimum of five Years of experience at degree level / industry.

The evaluations at final oral examination should be done jointly by the internal and external examiner

Code: BERCEE6302 INDUSTRIAL TRAINING SEMINAR-II (ITS) 6 Credit [LTP:0-0-2]

OBJECTIVE: To expose engineering students to technology development at work places and appraise them regarding shop-floor problems. To provide practical experience in solving open ended problems in real work setting so as to cause transfer of college based knowledge and skills to solve practical problems and there by develop confidence in the students in the analysis, synthesis and evaluation of practical problems leading to creative thinking.

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO1 Illustrate the effectiveness of research paper reading and writing.

CO2 Examine well recognized research papers from reputed journals, conferences.

CO3 Analyzethemethodofsearchingofresearchpaperconcludingtheworkdoneinpaper.

CO4 Analyze the abstract and methodologies of the research paper.

CO5 Illustrate the techniques to create a review paper.

GUIDELINES:

- At the end of the Fifth semester each student would undergo Industrial Training in an industry / Professional organization Research Laboratory with the prior approval of the Head of Department and Training & Placement Officer,
- Students shall be required to submit a written type report along with a certificate from the organization and present a PPT based on the training.
- Students shall be required to give the presentations in the allotted period about the training attended after 5th Semester.

The presentation and report of the Trainings hall be evaluated during this period (=2 hrs per week) by Board of Examiners to be appointed by the Faculty Coordinator-Training Seminar who will award the grades

CODE: BERCEE6601 DISCPLINEANDTALENTENRICHMENTPROGRAMME (TEP)-VI 1CREDIT

OVER VIEW AND OBJECTIVES:

The objective of Discipline and TEP is to provide students with the opportunities to enhance job fetching skills and at the same time to cultivate the student's personal interests and hobbies while maintaining the good disciplinary environment in the University. TEP is integrated in to the curriculum for holistic development of students through active participation in various activities falling in Technical and non-technical categories.

Discipline and Talent Enrichment Programme (TEP)–VI shall be evaluated irrespective of period / time allocation (as in the case of Extra Curricular activity) in the teachings Scheme as a One credit course. There cord related to discipline and related activities are maintained for each student and they shall be evaluated for the same also. It shall be counted in calculation of SGPA but it is not a backlog subject. However, the attendance of the classes shall be recorded and accounted in the total attendance.

Activities included in this category in the Third Semester are as follows:

CODE	ACTIVITY	HOURS	CREDITS
BERCEE6601	Online Certification Course	1	1

Code: BERCEE7101 Theory and Practical Aspect of Machine Learning 1 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO-1 To define and formulate a machine learning problem.

CO-2 To estimate an appropriate pattern analysis tool for analyzing data in a given feature space.

CO-3 To explore various classification and feature selection algorithms using machine learning techniques.

CO-4 To understand the concepts of Representation Learning with its real time applications.

CO-5 To design efficient models recent machine learning techniques, train models, conduct experiments, and develop real-world ML-based applications and products.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to ML	7
2.	Parameter Estimation	9
3.	Artificial Neural Networks and Foundations of Deep Learning	10
4.	Representation Learning	9
5.	Generative Models	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Introduction to ML**
	• Introduction of Unit • Definitions, Datasets for Machine Learning, Different Paradigms of Machine Learning, • Data Normalization, Hypothesis Evaluation, VC-Dimensions and Distribution, Bias-Variance Tradeoff, Regression(Linear) • Bayes decision rule, Minimum error rate classification, • Normal density and discriminant functions • Conclusion and Summary of Unit
2.	**Parameter Estimation**

	• Introduction of Unit • Parameter Estimation: Maximum Likelihood and Bayesian Parameter Estimation • Discriminative Methods: Distance-based methods, Linear Discriminate Functions, Decision Tree, Random Decision Forest and Boosting • Feature Selection and Dimensionality Reduction: PCA, LDA, ICA, SFFS,SBFS • Clustering: k-means clustering, Gaussian Mixture Modeling, EM-algorithm • Kernel Machines: Kernel Tricks, SVMs (primal and dual forms), K-SVR,K-PCA • Conclusion of Unit including real life applications
3.	**Artificial Neural Networks and Foundations of Deep Learning**
	• Introduction of Unit • Artificial Neural Networks: MLP, Back prop, and RBF-Net • Foundations of Deep Learning: DNN, CNN, Auto encoders, RNN, LSTM, Attention layers, Applications • Techniques to improve deep networks: DNN Optimization, Regularization, Auto ML • Conclusion of Unit including real life applications
4.	**Representation Learning**
	• Introduction of Unit. • Representation Learning: Unsupervised pre-training, transfer learning, and domain adaptation distributed representation, discovering underlying causes • Auto-DL: Neural architecture search, network compression, graph neural networks • Conclusion of Unit including real life applications
5.	**Generative Models**
	• Introduction of Unit • Probabilistic Generative Models: DBN, RBM • Deep Generative Models: Encoder-Decoder, Vibrational Auto encoder, • Generative Adversarial Network (GAN), Deep Convolution GAN, • Variants and Applications of GANs • Conclusion of Unit including real life applications

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Editio	Publication
1.	Understanding Machine Learning: From Theory to Algorithms	Shalev-Shwartz, S., Ben	Latest	Cambridge University Press
2.	Pattern Classification	R. O. Duda, P. E. Hart, D. G.	Latest	Wiley-Blackwell
3.	Machine Learning	Mitchell Tom	Latest	Tata Mc Graw-Hill
4.	Pattern Recognition and Machine Learning	C. M.BISHOP.	Latest	Springer-Verlag New York,
6.	, Introduction to deep learning	Charniak,E	Latest	The MIT Press
Websites				
□ https://nptel.ac.in/courses/108104048/				

Code: BERCEE7102	Power System	3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO1 To understand the basic concepts of power system.

CO2 To evaluate the balanced and unbalanced faults with protection against them.

CO3 To analyze line compensation techniques as applied in reactive power – voltage control and active power flow control.

CO4 To analyze the effect of stability constraints on power system operation

CO5 To evaluate the electricity market models and demand side management.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Basic Concepts	7
2.	Fault Analysis and Protection Systems	9
3.	Power Flow Analysis	10
4.	Stability Constraints in synchronous grids	9
5.	Power System Economics and Management	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Basic Concepts**
	• Introduction of Unit • Basic Concepts: Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids. • Generation: Conventional and Renewable Energy Sources. Distributed Energy Resources. Energy Storage. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems). Synchronous Grids and Asynchronous (DC) interconnections. • Review of Three-phase systems. Analysis of simple three-phase circuits. Power Transfer in AC circuits and Reactive Power • Conclusion and Summary of Unit
2.	**Fault Analysis and Protection Systems**

	• Introduction of Unit • Method of Symmetrical Components (positive, negative and zero sequences).Balanced and Unbalanced Faults. Representation of generators, lines and transformers in sequence networks. Computation of Fault Currents. Neutral Grounding. • Switchgear: Types of Circuit Breakers. Attributes of Protection schemes, Back-up Protection. Protection schemes (Over-current, directional, distance protection, differential protection) and their application. • Conclusion and Summary of Unit
3.	**Power Flow Analysis**
	• Introduction of Unit • Review of the structure of a Power System and its components. • Analysis of Power Flows: Formation of Bus Admittance Matrix. Real and reactive power balance equations at anode. • Load and Generator Specifications. Application of numerical methods for solution of non linear algebraic equations–Gauss Seidel and Newton-Raphson methods for the solution of the power flow equations. • Computational Issues in Large-scale Power Systems. □ Conclusion and Summary of Unit
4.	**Stability Constraints in synchronous grids**
	• Introduction of Unit • Swing Equations of asynchronous machine connected to an infinite bus. Power angle curve. Description of the phenomena of loss of synchronism in a single-machine infinite bus system following a disturbance like at three—phase fault. Analysis using numerical integration of swing equations (using methods like Forward Euler, Runge-Kutta 4^{th} order methods), as well as the Equal Area Criterion. • Impact of stability constraints on Power System Operation. • Effect of generation rescheduling and series compensation of transmission lines on stability • Conclusion and Summary of Unit
5.	**Power System Economics and Management**

	• Introduction of Unit • Basic Pricing Principles: Generator Cost Curves, Utility Functions, Power Exchanges, Spot Pricing. • Electricity Market Models (Vertically Integrated, Purchasing Agency, Whole-sale competition, Retail Competition) • Demand Side-management, Transmission and Distributions charges, Ancillary Services. Regulatory framework. • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Publication
1.	Power System Analysis	J. J. Grainger,William D.	McGraw-Hill
2.	Power System Engineering	Nagrath and Kothari	Tata Mc Graw Hill
3.	Power System Analysis (With Disk)	Haadi SAADAT	TMH
4.	Power System Analysis	T.K Nagsarkar & M.S.Sukhija	Oxford University Press, 2007.
5.	Elements of Power System Analysis	W.D. Stevenson,Jr.	Mc Graw Hill.

Code: BERCEE7103 Computational theory and Compiler Design 3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO1- To design computational models for formal languages.

CO2- To understand deterministic, non-deterministic automata and apply the acquired knowledge in real time problem.

CO3- To design symbol tables and use them for type checking and other semantic checks.

CO4- To explore Parsing problems and Turing Machines.

CO5- To understand the important aspects of Code optimization and Generation with its applications.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction To Languages and Grammars	8
2.	Regular Expressions and Finite Automata	9
3.	Myhill- Nerode Theorem	9
4.	CFG, PDAs and Turing Machines	9
5.	Intermediate Code Generation	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Introduction to Languages and Grammars**
	• Introduction to unit • Overview of a computational model-Languages and grammars–alphabets–Strings-Operations on languages Introduction to Compilers - Analysis of the Source Program -Phases of a Compiler • Conclusion and Summary of Unit
2.	**Regular Expressions and Finite Automata**
	• Introduction of Unit • Regular Expressions and Finite Automata Finite automata–DFA–NFA • Equivalence of NFA and DFA(With Proof) – Regular expressions • Conversion between RE and FA(With Proof) Lexical Analysis- Recognition of Tokens-Designing a Lexical Analyzer using finite automata • Conclusion and Summary of Unit
3.	**My hill-Nerode Theorem**

	• Introduction of Unit • Myhill-Nerode Theorem - Minimization of FA • Decision properties of regular languages–Pumping lemma for Regular languages (With Proof). • Conclusion and Summary of Unit
4.	**CFG, PDAs and Turing Machines**
	• Introduction of Unit • CFG, PDAs and Turing Machines CFG–Chomsky Normal Forms-NPDA–DPDA-Membership algorithm for CFG Syntax Analysis -Top-Down Parsing - Bottom-Up Parsing -Operator-Precedence Parsing – LR Parsers • Turing Machines–Recursive and recursively numerable languages–Linear bounded automata-Chomsky's hierarchy–Halting problem • Conclusion and Summary of Unit
5.	**Intermediate Code Generation**
	• Introduction of Unit • Intermediate Languages–Declarations-Assignment Statements-Boolean Expressions-Case Statements–Back patching – Procedure Calls. • Code Optimization-Basic Blocks and Flow Graphs–The DAG Representation of Basic Blocks-The Principal Sources of Optimization-Optimization of Basic Blocks-Loop sin Flow Graphs-Peephole Optimization - Introduction to Global Data-Flow Analysis • Code Generation–Issues in the Design of a Code Generator-The Target Machine-Run-Time Storage Management-Next-Use Information-Register Allocation and Assignment-A Simple Code Generator-Generating Code from DAG • Recent Trends–Just-in-time compilation with adaptive optimization for dynamic languages – Parallelizing Compilers • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Publication
1.	Introduction to languages and the theory of computation	• MartinJohn	• TMH
2.	"Introduction to Automata Theory, Languages and computation	• Motwani Hopcroft,Ullman	• Pear son Education
Websites			
https://nptel.ac.in/courses/108104013/ https://nptel.ac.in/courses/108108099/			

Code: BERCEE7104	FACTS Devices & Their Application	3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO1- To analyze the basic concept and principle of FACTS Devices.

CO2- To understand the behavior of Static Shunt Compensators and investigate the design aspects.

CO3- To understand the behavior of Static Series Compensators and investigate the design aspects.

CO4- To understand and identify the design principle and working of Static Voltage and Phase Angle Regulators.

CO5- To analyze the UPFC & IPFC.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Introduction to FACTS Devices	8
2.	Static Shunt Compensators	9
3.	Static Series Compensators	9
4.	Static Voltage and Phase Angle Regulators	9
5.	UPFC & IPFC	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Introduction to FACTS Devices**
	• Introduction of Unit • Problems of AC transmission systems, power flow in parallel paths and meshed system, • Factors limiting loading capability, Stability consideration. • Power flow control of an ac transmission line. • Basic types of facts controllers. Advantages of FACTS technology. • Conclusion of Unit including real life applications
2.	**Static Shunt Compensators**
	• Introduction of Unit • Mid-point and end point voltage regulation of transmission line, and stability improvement. • Basic operating principle of Static Synchronous Compensators (STATCOM). • Comparison between STATCOM and SVC. • Conclusion of Unit including real life applications
3.	**Static Series Compensators**

	• Introduction of Unit • Concept of series capacitive compensation, • Voltage and transient stabilities, power oscillation and sub synchronous oscillation damping. • Introduction to thrusters witched series capacitor(TSSC), • Thyristor controlled series capacitor (TCSC), and static synchronous series compensator, -operation, Characteristics and applications. • Conclusion of Unit including real life applications
4.	**Static Voltage and Phase Angle Regulators**
	• Introduction of Unit • Voltage and phase angle regulation. Power flow control and improvement of stability by phase angle regulator. • Introduction to thyristor controlled voltage and phase angle regulators (TCVR and TCPAR) (ii) Introduction to thyristor controlled braking resistor and thyristor Controlled voltage limiter. • Conclusion of Unit including real life applications
5.	**UPFC & IPFC**
	• Introduction of Unit • UPFC: Unified Power Flow Controller (UPFC), basic operating principles, Conventional transmission control capabilities. Comparison of UPFC to series Compensators and phase angle regulator. Applications of UPFC. • IPFC: Interline Power Flow Controller (IPFC), basic operating principles and Characteristics. Applications of IPFC • Conclusion of Unit including real life applications

C. RECOMMENDED STUDYMATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Flexible AC Transmission Systems	K. R.Padiyar	Latest	New age publications
2.	Understanding FACTS	N. G.Hingorani	Latest	IEEE Press Book
3.	Electric Drives- Concepts and Applications	VSubrahmanyam	Latest	TMH
4.	A First Course on Electrical Drives	S KPillai	Latest	Wiley Eastern limited, India
5.	Power Semiconductor Controlled Drives	G KDubey	Latest	Prentice Hall, Englewood Cliffs
Websites				
• https://nptel.ac.in/courses/108104140/ • https://nptel.ac.in/courses/108104011/				

Code: BERCCE7105 DATA BASE MANGEMENT SYSTEM 3 Credits [LTP:3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO1 To discuss the purpose and objectives DBMS.

CO2 To execute the logical design of the database.

CO3 To interpret a database using SQL, DDL and DML.

CO4 To demonstrate the relational database management system

CO5 To describe the transaction management and deadlock handling

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	DBMS Architecture	8
2.	Data base Design	9
3.	SQL, DDL and DML	9
4.	Internal of RDBMS	9
5.	Transaction Management & Dead lock Handling	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**DBMS Architecture**
	• Introduction of Unit • Introduction, need, purpose and goals of DBMS. DBMS Architecture, • Concept of keys, Generalization and specialization, • Introduction to relational data model, ER modeling, concept of ER diagram • Conclusion and Summary of Unit
2.	**Data base Design**
	• Introduction of Unit • Database Design: Conceptual Data Base design. Theory of normalization, Primitive and composite data types, concept of physical and logical databases, Data abstraction and data independence, relational algebra and relational calculus. • Conclusion and Summary of Unit
3.	**SQL, DDL and DML**
	• Introduction ofUnit • Constraints assertions, views database security. • Application Development using SQL: Host Language interface embedded SQL • GL's, Forms management and report writers. Stored procedures and triggers. • Dynamic SQL,JDBC.

	• Conclusion and Summary of Unit
4.	**Internal of RDBMS**
	• Introduction of Unit • Internal of RDBMS: Physical data organization in sequential, indexed, random and hashed • Inverted and multi-list structures • Conclusion and Summary of Unit
5.	**Transaction Management & Dead lock Handling**
	• Introduction of Unit • Transaction Management: Transaction concept, transaction state, serializability, conflict serializability, views serializability. • Concurrency Control: Lock based protocol. • Deadlock Handling: Prevention detection, recovery. • Recovery System: Log based recovery. • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Publication
1.	Database Management Systems	Raghu Rama Krishnan	McGraw-Hill
2.	Database System Concepts	Silver schatz Korth and Sudarshan:	Tata Mc Graw Hill
3.	Fundamentals of Data Base Systems,	Elmasari	Pearson Education
4.	Database Management System	Majumdar & Bhattacharya:	Tata Mc Graw Hill.

Code: BERCEE7111 SOLAR THERMAL ENGINEERING PROCESSES 3 Credits [LTP: 3-0-0]

COURSEOUTCOMES: After Successful completion of the course students will be able-

CO1- To explain the principles of solar collectors and solar thermal systems,

CO2- To identify the solar collector components and evaluate collector performance,

CO3- To estimate the optimal size of solar thermal systems by modern tools.

CO4- To illustrate technological and socio-economic issues on solar collectors.

CO5- To design economic solar thermal system.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction	8
2.	Industrial Applications of Solar Heat	9
3.	Flat-plate Collectors Designs	9
4.	Concentrating Collector Designs	9
5.	Economics and design of Solar Thermal Systems	9

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction**
	• Introduction of Unit • Principles of renewable energy: Fundamentals; Scientific principles, technical implications, and social implications, Different types of Renewable Energy Sources, Sunasa Source of Energy, Solar Radiation, Extra Terrestrial at Earth's Surface–Horizontal, Tilted Surface, Estimation of Radiation, Alternation of Solar Radiation by Atmosphere, Effect of Orientation of Receiving Surface, Present and future scope of solar energy. • Conclusion and Summary of Unit
2.	**Software & Instruction Set**
	• Introduction of Unit • Temperature requirements, consumption pattern, Solar Passive Heating and Cooling, Modeling of Photo thermal and photovoltaic solar energy system, Solar Desalination, Solar Drying, Solar Cooking, Solar pond, solar refrigeration Solar Green house technology: Fundamentals, design, Modeling and applications in agriculture and space heating. • Conclusion and Summary of Unit

3.	**Flat-plate Collectors Designs**
	• Introduction of Unit • Theory of Flat Plate Collectors Radiation transmission through covers-product, Basic Energy Equation of Collector, Temperature Distribution-Overall loss coefficients-thermal analysis of collectors-overall design methodology - performance test of collector.. • Conclusion and Summary of Unit
4.	**Concentrating Collector Designs**
	• Introduction of Unit • Concentrator collectors–classification-design and performance parameters-tracking systems-compound parabolic concentrators- parabolic trough concentrators-concentrators with point focus-Heliostats–performance of the collectors, Central Receiver Collector, Characteristic Features, Performance Analysis, advantages and Thermal Applications of Collectors. • Conclusion and Summary of Unit
5.	**Economics and design of Solar Thermal Systems:**
	• Introduction of Unit • Economics of Solar Thermal Systems, Klein's Method f-charts-P-charts, Long term economics of solar thermal system. Utilizability methods of solar thermal system evaluation. Component design: Energy balance of components, design process and parameters, volumetric receiver, direct absorption receiver, receiver loss calculations, thermal storage for solar power plants. • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Expert Handbook for Planning, Design and Installation	NA	NA	Earth scan Ltd
2.	Solar Water and Pool Heating Manual	NA	NA	Florida Solar Energy Center
3.	Planning and Installing Solar Thermal Systems: A Guide for Installers, Architects and Engineers	NA	NA	Kindlee Book
Websites				
▯ https://nptel.ac.in/courses/112105051/ ▯ https://nptel.ac.in/content/storage2/courses/112105050/m1l1.pdfI				

Code: BEREEE7112 EHV AC/DC TRANSMISSION SYSTEM 3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

- To make students understand the basic knowledge about EHV AC Transmission.
- To make students understand the basic knowledge about HVDC Transmission
- To understand the concept of Load Frequency Control, Voltage Control & their applications.
- To learn about FACTS devices..

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	EHV AC Transmission	8
2.	Load Frequency Control	9
3.	Voltage Control	9
4.	FACTS	9
5.	HVDC Transmission	9

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**EHV AC Transmission**
	• Introduction to unit • Need of EHV transmission lines, power handling capacity and surge impedance loading • Problems of EHV transmission, bundled conductors: geometric mean radius of bundle, properties of bundle conductors • Electrostatic fields of EHV lines and their effects, corona effects: Corona loss, audio and radio noise. • Conclusion and Summary of Unit
2.	**Load Frequency Control**
	• Introduction of Unit • ntroduction to control of active and reactive power flow, turbine speed governing system. • Speed governing characteristic of generating unit and load sharing between parallel operating generators • Method of Load Frequency Control: Flat frequency, flat tie line and tie line load bias control. • Automatic generation control (description of block diagram only). • Conclusion and Summary of Unit
3.	**Voltage Control**
	• Introduction of Unit • No load receiving end voltage and reactive power generation. Methods of voltage control • Synchronous phase modifier, shunt capacitors and reactors, saturable reactors, • Thyristorised static VAR compensators- TCR, FC-TCR and TSC- TCR. • Conclusion and Summary of Unit
4.	**FACTS**
	• Introduction of Unit • Introduction to FACTS controllers, types of FACTS controllers, • Brief description of STATCOM • Thyristor controlled series capacitors and unified power flow controller. . • Conclusion and Summary of Unit

5.	**HVDC Transmission**:
	• Introduction of Unit • Types of D.C. links, advantages and disadvantages of HVDC transmission. • Basic scheme and equipment of converter station. Ground return • Basic principles of DC link control and basic converter control characteristics. • Application of HVDC transmission. • Conclusion and Summary of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Publication
1.	HVDC Power Transmission Systems	K.R. Padiyar	NEW AGE PUB
2.	HVDC Power Transmission System	K.R, Padiyar	Wiley Eastern Ltd.
3.	Direct Current Transmission	E.W. Kimbark	Wiley Interscience
4.	H.V.D.C Transmission,	J. Arrillaga	Peter Peregrines
5.	Computer Modelling of Electrical Power System	J. Arrillaga	John Wiley
Websites			
• https://nptel.ac.in/courses/108104013/ • https://nptel.ac.in/courses/108108099/			

BEREEE7113 ELECTRONIC CIRCUITS FOR RENEWABLE SYSTEM 3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO1- To understand and identify the need of renewable energy resources.

CO2- To analyze concepts and use of various power electronics converters in photovoltaic systems.

CO3-To understand the role of power electronic converters in wind energy conversion system.

CO4- To demonstrate and analyze the Fuel cell technology.

CO5- To classify the stand alone, grid connected and hybrid renewable energy systems

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Introduction to Renewable Energy Resources	7
2.	Power Converters for Solar PV Systems	9
3.	Converters for Wind Energy Systems	10
4.	Fuel Cell	9
5.	Hybrid Renewable Energy Systems	9

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Introduction to Renewable Energy Resources**
	- Introduction of Unit - Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; - Non-Conventional Energy Resources–Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources; World Energy Scenario; Indian Energy Scenario - Conclusion and Summary of Unit
2.	**Power Converters for Solar PV Systems**
	- Introduction of Unit - Photovoltaic Systems: Photo Voltaic (PV): cell, module, array and panel - Home solar PV system, Components of a home solar system - Solar PV power plants: Solar PV technologies overview-stationary and concentrated PV, inverter and control technologies, standalone systems, grid connected systems - Charge Controller for PV Systems: Design and Analysis of Buck, Boost and Buck-Boost converters
3.	**Converters for Wind Energy Systems**
	- Introduction of Unit - Electrical Machines for Wind Energy Conversion Systems: Review of reference theory fundamentals-Principle of operation and analysis: Induction Generator: Squirrel Cage Induction Generator (SCIG), Doubly Fed Induction Generator (DFIG) - Permanent Magnet Synchronous Generator (PMSG). - Power electronic circuits: Soft starters, Back-to-back converters, Multi-level converters - Conclusion and Summary of Unit
4.	**Fuel Cell**

	• Introduction of Unit • Fuel Cell-Working Principle–Distributed generation–Fuel cell based energy system for DG–Power electronic topologies for residential stationary fuel cell energy systems–Issues in fuel cell power conditioning system–Energy management system issues–Auxiliary storage Modeling of Fuel cell, power extraction for fuel cell, Stand-alone fuel cell system with consumer/ load • Conclusion and Summary of Unit
5.	**Hybrid Renewable Energy Systems**
	• Introduction of Unit • Need for Hybrid Systems-Range and type of Hybrid systems-Case studies of Diesel- PV, Wind-PV, Micro hydel-PV, • Biomass-Diesel systems - Maximum Power Point Tracking (MPPT) • Conclusion and Summary of Unit

C. **RECOMMENDED STUDYMATERIAL**:

Sr. No	Reference Book	Author	Edition	Publication
1.	Power Electronics Circuits, Devices and Applications	Rashid .M.H		Academic press, 2001.
2.	Power Electronics: converters, Application and design	Ned Mohan,Undelanda nd		JohnWileyandsons.Inc, Newyork,Reprint-2009
3.	Power Electronics for Renewable Energy Systems, Transportation and Industrial Applications	Haitham Abu-Rub, Mariusz Malinowski, KamalAl-Haddad	1stEdi tion	Wiley-IEEE Press; 1 edition (July 28, 2014)
4.	Non-conventional energy sources	Rai.G.D		Khanna publishers,2004.
5.	Renewable Energy: Power sustainable future	Godfrey Boyl	Thirde dition,	Oxford Univers ityPress
6.	Electric motor drives-modeling, analysis and control	KrishnanR.,		Prentice Hall of India Pvt. Ltd., 2007
7.	Modern power electronics and AC drives	BimalK.Bose		Pearson Education(Singapore)
Websites				
□ https://www.nrel.gov □ https://mnre.gov.in				

Code: BERCEE7201	POWER SYSTEM LAB	1 Credits [LTP:0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able-

CO1	To implement the concept of A.C. & DC Distribution and to analysis the various parameters of the transmission line.
CO2	To perform the simulation of the concepts of power system.
CO3	To calculate the sequence impedances and their effect on power system.
CO4	To measure earth resistance and insulation resistance in the power system.
CO5	To analyze the protection units of the power system

LIST OFEXPERIMENTS:

1.	A.C. & DC Distribution
2.	Efficiency, Regulation & ABCD parameters of Transmission line
3.	Study of different types of insulators
4.	Computer simulation of power system
5.	Per unit representation of a power system
6.	Measurement of positive, negative and zero sequence impedance and currents
7.	Measurement of earth resistance
8.	Measurement of insulation resistance of insulators
9.	Transmission line fault analysis
10.	Effect of fault resistance on voltage regulation
11	To study grading protection using inverse time over current relay
12	Study of circuit breakers
13	Study of digital protection

Virtual Lab- http://vp-dei.vlabs.ac.in/Dreamweaver/,https://www.iitk.ac.in/ee/system-simulation-research-lab

Code: BERCCE7202 NATURAL LANGUAGE PROCESSING LAB 1 Credits [LTP: 0-0-2]

LABOUTCOMES: After Successful completion of the lab students will be able to-

CO1- To organize word analysis and generation

CO2- To Identify the concepts of morphology with real time applications.

CO3- To understand and evaluate the POS tagging (Hidden Markov and Viterbi Decoding).

CO4- To understand the process of chunking and able to design the algorithms.

CO5- To elaborate the concept and process of Building Chunker.

LIST OFEXPERIMENTS:

1.	Word Analysis
2.	Word Generation
3.	Morphology
4.	N-Grams
5.	N-Grams Smoothing
6.	POS Tagging: Hidden Markov Model.
7.	POS Tagging: Viterbi Decoding
8.	Building POSTagger
9.	Chunking
10.	Building Chunker

Virtual lab-https://nlp-iiith.vlabs.ac.in/

Code: BERCCE7203	DBMS LAB	1 Credits [LTP: 0-0-2]

COURSE OUTCOMES: After Successful completion of the lab students will be able-

CO1 To enable the students to design rational database systems.

CO2 To understand the data manipulation language.

CO3 To manages queries using the different functions.

CO4 To perform the trigger operations.

CO5 To understand the various procedures required for the management of database.

LIST OFEXPERIMENTS:

1.	To study and perform Concept design with E-R Model
2.	To study and perform Relational Model
3.	To study and perform Normalization
4.	To study and perform on Practicing DDL commands
5.	To study and perform on Practicing DML commands
6.	To study and perform on Querying (using ANY, ALL, IN, Exists, NOTEXISTS, UNION, INTERSECT, Constraints etc.)
7.	To study and perform on Queries using Aggregate functions, GROUPBY, HAVING and Creation and dropping of Views.
8.	To study and perform on Triggers (Creation of insert trigger, delete trigger, update trigger)
9.	To study and perform on Procedures
10.	To study and perform on Usage of Cursors

BERCHM7209	PROFESSIONAL SKILLS-II	1 Credit [LTP: 0-0-2]

Course Outcomes:

On successful completion of the course the learners will be able to

CO	Cognitive Abilities	Course Outcomes
CO-01	Create	Formulate appropriate updates as a means to promote business activities on social medial with the help of experience, education, and skills.
CO-02	Create	Demonstrate the use of grammar and formatting in formal documents to complete the writing process (prewriting/writing/rewriting).
CO-03	Evaluate	Evaluate presentation's weak spots and areas for improvement & learn, practice and acquire the skills necessary to deliver effective presentation with clarity and impact.
CO-04	Evaluate	Evaluate basic factors such as personal skills & abilities, career fields, willingness to learn and improve their employability skills.
CO-05	Create	Develop team skills dynamics and critical thinking to acquire solution driven attitude by analyzing different case studies.

UNIT NO.	UNIT NAME	HOURS
1	**Personal Branding**	**4**
2	**Professional Writing-II**	**6**
3	**Presentation Skills: Professional Setting**	**4**
4	**Job Interview & Group Discussion : Preparation by Mock Practice**	**6**
5	**Negotiation Skills, Team Management & Professional Awareness**	**5**

LIST OF LABS	
1.	Personal Branding : Its best practices
2.	Professional Writing II: Abstract Writing, Statement of purpose and other formal documents
3.	Expanding Professional Vocabulary
4.	Resume Building-II: Revising & Updating
5.	E-Learning & E-Content Development-II
6.	Presentation Skills in Professional Setting
7.	Job Interviews II: Preparation and Presentation for Mock Interviews
8.	Advanced Group Discussion-II: Analysis of professional GD Videos and Practices on Topics/Video/Article based topics
9.	Negotiation Skills & and Conflict Resolution-II
10.	Change and Transition Management
11.	Team Building Strategies: Project Management
12.	Career Awareness & Productive Mindset

Code: BERCHM7210	Use of Social Media	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES:

On successful completion of the course the learner will be able to

CO	Course Outcomes
CO1	To develop analytical framework to recognize, understand, and manage new social practices online, together with a familiarity with the literature regarding social media and identity, community, collective action, public sphere, social capital, and social networks.
CO2	Learn to use new social media, assess a new social medium's potential cognitive, social, and political impact, and to tune or relinquish use of the medium for their own purposes.
CO3	Understand the importance of monitoring and responding to the community that forms around your message or lack of message.
CO4	Understand the difference between traditional marketing and social media marketing & learn the functionality of LinkedIn, Facebook, Instagram etc.
CO5	Learn how to update and manage the experience, education, and skills & expertise sections & formulate appropriate updates as a means to promote business activities.

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	**Introduction to Social Media**	**2**
2	**The shift of marketing and PR tactics**	**3**
3	**Utilization of social media platforms like Facebook, Blogging, Twitter & LinkedIn, Instagram, Pinterest, YouTube & Snapchat best Practices**	**10**
4	**Introduction to web, domain, IP, web hosting, website creation, various platforms and CMS**	**5**
5	**How to create website using WordPress CMS, themes and plugins and how to make website live.**	**5**

A. DETAILED SYLLABUS

Unit	Unit Details	
1.	**Introduction to Social Media**	**Method**
	● Introduction of the Course & the topic ● Know your why - why you want to be on social media. ● Attraction towards social online portals ● Practice Sessions. ● Conclusion & Summary of the Unit.	● Theory/Practical ● Practical ● Practical ● Practical ● Theory/Practical
2.	**The shift of marketing and PR tactics**	
	● Introduction of the Course & the topic. ● What value your SM profiles will add on your resume. ● Practice Sessions. ● Conclusion & Summary of the Unit.	● Theory/Practical ● Practical ● Practical ● Theory/Practical
3.	**Utilization of Social Media Platforms like Facebook, Blogging, Twitter, LinkedIn, Instagram, Pinterest, YouTube & Snapchat best Practices**	
	● Introduction of the Course & the topic ● Practice Sessions. ● Conclusion & Summary of the Unit	● Theory/Practical ● Practical ● Theory/Practical
4.	**Introduction to web, domain, IP, web hosting, website creation, various platforms and CMS**	
	● Introduction of the Course & the topic ● Practice Sessions.	● Theory/Practical ● Practical

	● Conclusion & Summary of the Unit.	● Theory/Practical
5.	**How to create website using WordPress CMS, themes and plugins and how to make website live.**	
	● Introduction of the Course & the topic ● Practice Sessions. ● Conclusion & Summary of the Unit.	● Theory/Practical ● Practical ● Theory/Practical

Code: BEREEE7601 Discipline and Talent Enrichment Programme 1 Credit [LTP: 0-0-2]

OVER VIEW AND OBJECTIVES:

The objective of Discipline and TEP is to provide students with the opportunities to enhance job fetching skills and at the same time to cultivate the student's personal interests and hobbies while maintaining the good disciplinary environment in the University. TEP is integrated in to the curriculum for holistic development of students through active participation in various activities falling in Technical and non technical categories.

Discipline and Talent Enrichment Programme (TEP)–VII shall be evaluated irrespective of period / time allocation (as in the case of Extra Curricular activity) in the teachings Scheme as a One credit course. There cord related to discipline and related activities are maintained for each student and they shall be evaluated for the same also. It shall be counted in calculation of SGPA but it is not a backlog subject. However, the attendance of the classes shall be recorded and accounted in the total attendance.

Activities included in this category in the Third Semester are as follows:

CODE	ACTIVITY	HOURS	CREDITS
BERCEE7601	CRT	2	1
	Online Certification Course	1	

Code: BERCEE8101	Power System Restructuring and Smart Grid	3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO1- To understand the concepts of Smart grid Technologies.

CO2- To examine the Sensing, Measurement, Control and Automation in smart grid.

CO3- To discriminate between Micro Grids And Distributed Energy Resources.

CO4- To investigate Power Quality Management In Smart Grid

CO5- To design Information And Communication Technology For Smart Grid.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to Smart Grid	8
2.	Sensing, Measurement, Control and Automation	9
3.	Micro Grids And Distributed Energy Resources	9
4.	Power Quality Management In Smart Grid	9
5.	Information And Communication Technology For Smart Grid	9

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Smart Grid**
	• Introduction of Unit • Evolution of Electric Grid, Concept of Smart Grid, Definitions • Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid • Concept of Resilient & Self-Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid, CDM opportunities in Smart Grid, What is a Smart Grid?, The Smart Grid Enables the Electric Net SM, Local Energy Networks • Electric Transportation, Low-Carbon Central Generation, What Should Be the Attributes of the Smart Grid?, Why Do We Need a Smart Grid?, Is the Smart Grid a "Green Grid"?, Smart Grid Initiative for Power Distribution Utility in India □ Conclusion and Summary of Unit
2.	**Sensing, Measurement, Control and Automation**

	• Introduction of Unit • Smart metering and demand-side integration, Introduction, Smart metering, Evolution of electricity metering, Key components of smart metering, Smart meters: An overview of the hard ware used Signal acquisition, Signal conditioning, Analogue to digital conversion, Computation, Input/output • Communication, Communications infrastructure and protocols for smart metering, Home-area network, Neighborhood area network, Data concentrator, Meter data management system, Protocols for communications, • Demand-side integration, Services provided by DSI , Implementations of DSI, Hardware support to DS I implementations, Flexibility delivered by prosumers from the demand side, System support from DSI. • Conclusion and Summary of Unit
3.	**Micro Grids And Distributed Energy Resources**
	• Introduction of Unit • Concept of micro grid, need & applications of micro grid, formation of micro grid, issues of interconnection, protection & control of micro grid. Islanding, need and benefits, different methods of is landing detection. • Distributed Energy Resources: Small scale distributed generation, Distributed Generation Technology, Internal Combustion Engines, Gas Turbines, Combined Cycle Gas Turbines, Micro turbines, Fuel Cells, Solar Photovoltaic, Solar thermal, Wind power, Geo thermal, -all sources as a DG. Advantages and disadvantages of DG**.** • Conclusion of Unit
4.	**Power Quality Management In Smart Grid**
	• Introduction of Unit • Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, • Web based Power Quality monitoring, Power Quality Audit. • Conclusion of Unit including real life application.
5.	**Information And Communication Technology For Smart Grid**
	• Introduction of Unit • Information And Communication Technology For Smart Grid: Advanced Metering Infrastructure (AMI),Home Area Network (HAN), Neighborhood Area Network(NAN) • Wide Area Network(WAN).Bluetooth, Zig-Bee, GPS, Wi-Fi, Wi-Max based communication, Wireless Mesh Network, Broadband over Power line(BPL). • Conclusion of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Publication
1.	"Integration of Green and Renewable	Ali K., M.N. Marwali, MinDai	Wiley
2.	The Smart Grid: Enabling Energy	Clark W.Gellings	CRC press
3.	Smart Grid: Technology and Applications	Janak aEkana yake, N. Jenkins,	Wiley
4.	Smart Grids	Jean Claude Sabon nadiere	Wiley Black well
Websites			
□ https://nptel.ac.in/courses/108107113/			

Code: BERCEE8102	Digital Image Processing	3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO1 To understand the fundamentals and representation of digital image.

CO2 To analyze the processing of color image.

CO3 To recognize the segments in image.

CO4 To demonstrate the ideas of Image Segmentation

CO5 To relate and recognize the various objects in an image.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Introduction and Digital Image Fundamentals	8
2.	Image Restoration and Reconstruction	9
3.	Image Compression	9
4.	Image Segmentation	9
5.	Object Recognition and Case studies	9

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction and Digital Image Fundamentals**
	• Introduction of Unit • Digital Image Fundamentals, Human visual system, Image as a 2Ddata • Image representation – Gray scale and Color images, image sampling and quantization • Image enhancement in Spatial domain: Basic gray level Transformations, Histogram Processing Techniques, • Spatial Filtering, Low pass filtering, High pass filtering • FilteringintheFrequencyDomain:PreliminaryConcepts,Extensiontofunctionsoftwov ariables,ImageSmoothing, Image Sharpening, Homo morphic filtering • Conclusion of Unit including real life applications
2.	**Image Restoration and Reconstruction**
	• Introduction of Unit • Noise Models, Noise Reduction, Inverse Filtering, MMSE (Wiener)Filtering • Color Image Processing: Color Fundamentals, Color Models, Pseudo color image processing • Conclusion of Unit including real life applications

3.	**Image Compression**
	• Introduction of Unit • Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, LZW coding, JPEG Compression standard • Morphological Image Processing: Erosion, dilation, opening, closing, Basic Morphological Algorithms: • Conclusion of Unit including real life applications
4.	**Image Segmentation**
	• Introduction of Unit • point, line and edge detection, Thresholding, Regions Based segmentation, • Edge linking and boundary detection, Hough transform breakers. • Conclusion of Unit including real life applications..
5.	**Object Recognition and Case studies**
	• Introduction of Unit • Object Recognition and Case studies • Object Recognition- patterns and pattern classes, • recognition based on decision – theoretic methods, structural methods, • case studies – image analysis • Application of Image processing in process industries • Conclusion of Unit including real life applications

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Digital Image Processing	Gonzalez &Woods	Latest	Pearson education
2.	Fundamentals Digital Image Processing	Jain AnilK	Latest	Prentice Hall India
3.	Image Processing, Analysis and Machine Vision	Milan Sonka, Vaclav Hlavav, Roger Boyle	Latest	Thomson Learning
4.	Digital Image Processing	PrattW.K	Latest	John Wiley &Sons
Websites				
https://nptel.ac.in/courses/108101039/ https://nptel.ac.in/content/storage2/courses/108101039/download/Lecture-1.pdf				

Code: BEREEE8111	Optimization Theory	3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able-

CO1 To Study Introduction and Classification

CO2 To Understand Single Variable Optimization

CO3 To Develop Multi variable Optimization

CO4 To Design Other Optimization Techniques

CO5 To Apply Applications of Optimization in real problems

A. OUTLINE OF THECOURSE

Unit	Title of the unit	Time required for the Unit (Hours)
1.	Introduction and Classification	8
2.	Single Variable Optimization	7
3.	Multivariable Optimization	7
4.	Other Optimization Technics	8
5.	Applications of Optimization	6

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Introduction and Classification**
	• Introduction of Unit • Basic concept of optimization, Mathematical formulation of optimization problems; • Applications of optimization in engineering. • Classification of Optimization Problems • Single variable problems, Multivariable problems without constraints, • Multivariable problems with constraints, Maximization and minimization problems. • Conclusion and Summary of Unit
2.	**Single Variable Optimization**
	• Introduction of Unit • Necessary and sufficient conditions for optimum; • Interpolation method quadratic. • Region elimination methods- • Internal halving, Fibonacci. • Conclusion and Summary of Unit

3.	**Multivariable Optimization**
	• Introduction of Unit • Optimization of Functions One Dimensional Search: • Analytical Methods: classification, stationary points, direct substitution, • constrained variation, penalty function, Lagrangian Multiplier, • Kuhn-Tucker theorem. Numerical methods general principles of numerical search, • direction of search, final stage in search, • Direct search, pattern search. • Conclusion and Summary of Unit
4.	**Other Optimization Techniques**
	• Introduction of Unit • Introduction to geometric, dynamic and integer programming and genetic algorithms. • Application of Geometric Programming: • Engineeringproblemswithdegreeofdifficultyequaltozerooronewithconstraints. • Conclusion and Summary of Unit
5.	**Applications of Optimization**
	• Introduction of Unit • Optimization of staged and discrete processes. • Engineering Optimization problems and solutions. • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Introduction to Operations	Hillier F.S.and	Latest	CBS Publishers.
2.	Operations Research	TahaH.A.	Latest	Pearson Education. Pearson,
3.	Principles of Operations Research	WagnerH.M.	Latest	Prentice Hall of India
4.	Linear Programming and Network	Bazaraa , Jarvisand	Latest	Wiley India.

Code: BEREEE8112 POWER SYSTEM OPERATION AND CONTROL 3 Credits [LTP: 3-0-0]

COURSEOUTCOMES: After Successful completion of the course students will be able-

CO1-To understand the concepts of Power System Operation and Control.

CO2-To categorize Power-Frequency Dynamics and Design Power-Frequency Controller.

CO3-To investigate the concepts of Reactive Power Voltage Interaction.

CO4-To design the Economic Operation of Power System.

CO5- To develop Computer Control of power system.

A. OUTLINE OF THECOURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Introduction	9
2.	Real Power – Frequency Control	8
3.	Reactive Power–Voltage Control	9
4.	Unit Commitment And Economic Dispatch	8
5.	Computer Control Of Power Systems	8

B. DETAILEDSYLLABUS

Unit	Unit Details
1.	**Introduction**
	• Introduction of Unit • An Overview Of Power System Operation And Control – System Load Variation – Load Characteristics– • Load Curves And Load-Duration Curve–Load Factor–Diversity Factor–Importance Of Load Forecasting And Quadratic And Exponential Curve Fitting Techniques Of Forecasting–Plant Level And System Level Controls • Conclusion and Summary of Unit
2.	**Real Power – Frequency Control**
	• Introduction of Unit • Basics Of Speed Governing Mechanism And Modeling–Speed-Load Characteristics–Load Sharing Between Two Synchronous Machines In Parallel – Control Area Concept –L • FC Control Of A Single- Area System–Static And Dynamic Analysis Of Uncontrolled And Controlled Cases–Two-Area System • Modeling–Static Analysis of Uncontrolled Case–Tie Line With Frequency Bias Control– State Variable Model – Integration Of Economic Dispatch Control With LFC. • Conclusion and Summary of Unit
3.	**Reactive Power–Voltage control**

	▪ Introduction of Unit ▪ Generation And Absorption Of Reactive Power–Basics Of Reactive Power Control–Excitation Systems–Modeling – Static And Dynamic Analysis – Stability Compensation– ▪ Methods Of Voltage Control: Tap changing Transformer, SVC (TCR+TSC) And STATCOM–Secondary Voltage Control ○ Conclusion and Summary of Unit
4.	**Commitment And Economic Dispatch**
	• Introduction of Unit • Formulation Of Economic Dispatch Problem–I/O Cost Characterization–Incremental Cost Curve–Coordination Equations Without And With Loss (No Derivation Of Loss Coefficients)– • Solution By Direct Method And Λ-Iteration Method–Statement Of Unit Commitment Problem–Priority-List Method – Forward Dynamic Programming • Conclusion of Unit including real life application
5.	**Computer control of power systems**
	• Introduction of Unit • Need For Computer Control Of Power Systems–Concept Of Energy Control Centre – Functions – System Monitoring – Data Acquisition And Control – System Hardware Configuration– • SCADA And EMS Functions–Network Topology–State Estimation–WLSE–Contingency Analysis–State Transition Diagram Showing Various State Transitions And Control Strategies. • Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Publication
1.	Electric Energy Systems Theory – An Introduction	Olle.I.Elgerd	TMH
2.	Power Generation, Operation And Control	Allen. J. Wood And Bruce F. Wollenberg	John Wiley & Sons, Inc., 2003.
3.	Power System Analysis Operation And Control	Abhijit Chakrabarti, Sunita Halder	PHI Learning Pvt.Ltd
4.	Power System Analysis	C.A.Gross	Wiley India
Websites			
https://nptel.ac.in/courses/108101040/ https://nptel.ac.in/content/syllabus_pdf/108104052.pdfI			

Code: BERCEE8201	ENERGY SYSTEMSLAB	1 Credits [LTP:0-0-2]

LABOUTCOMES: After Successful completion of the lab students will be able to-

CO1- To Simulate and analyze the Solar PV Energy System.

CO2- To model and analyze the Wind Energy Conversion System.

CO3- To analyze the Hybrid (Solar-Wind) Power System.

CO4- To Execute Experiment on Performance Assessment of 100W Fuel cell.

CO5- To Design MATLAB model, simulate, and compare result with hardware model of hydro energy conversion system.

LIST OFEXPERIMENTS

1.	Simulation study on Solar PV Energy System.
2.	Experiment on "VI-Characteristics and Efficiency of 1kWp Solar PV System".
3.	Experiment on "Shadowing effect & diode based solution in1kWp Solar PV system".
4.	Experiment on Performance assessment of Grid connected and Standalone1kWp Solar Power System.
5.	Simulation study on Wind Energy Generator.
6.	Experiment on Performance assessment of micro Wind Energy Generator.
7.	Simulation study on Hybrid (Solar-Wind) Power System.
8.	Experiment on Performance Assessment of Hybrid (Solar-Wind) Power System.
9.	Simulation study on Hydel Power.
10.	Experiment on Performance Assessment of 100W Fuel.
11.	Simulation study on Intelligent Controllers for Hybrid Systems.

Virtual lab-https://ied-nitk.vlabs.ac.in/

Code: BERCEE8202 DIGITAL IMAGE PROCESSESIN LAB 1 Credits [LTP:0-0-2]

LABOUTCOMES: After Successful completion of the lab students will be able-

CO1	To understand the requirement of image transforms and their properties.
CO2	To understand the feature extraction techniques for image analysis and recognition
CO3	To understand techniques employed for the enhancement of images.
CO4	To learn different feature extraction methods for image analysis.
CO5	To understand the requirement of segmentation of an image and to learn the frequency domain techniques of image compression.

LIST OFEXPERIMENTS:

1.	To create a program to display gray scale image using read and write operation.
2.	To create a vision program to find histogram value and display histo graph of a gray scale and color image.
3.	To create a vision program for Non Linear Filtering technique using edge detection
4.	To create a vision program to determine the edge detection of an image using different operators.
5.	To create a program to discretize an image using Fourier transformation.
6.	To create a program to eliminate the high frequency components of an image.
7.	To create a color image and perform read and write operation.
8.	To obtain the R, B, G colour values and resolved colour values from a colour box by choosing any colour.
9.	To create a program performs discrete wavelet transform on image.
10.	To create a program for segmentation of an image using water shed transforms.

Code: BERCEE8301	MAJOR PROJECT	8 Credits [LTP: 0-0-16]

COURSE OUTCOMES: After Successful completion of the lab students will be able to-

CO1 Predict a problem of current relevance to society

CO2 Formulate the problem and identify suitable modelling paradigm

CO3 Categorize the problem and identify the solution methodology

CO4 Simulate and design systems using various modern tools

CO5 Validate the results and prepare a project report

GUIDE LINES:

1. The Project group in seventh term will continue the project work in eighth term and complete project in all respect (assembly, testing, fabrication, tabulation, test result etc.)
2. The group should maintain a log book of activities. It should have entries related to the worked one, problems faced, solution evolved etc., duly signed by guide.
3. The guides should regularly monitor the progress of the project work.
4. The project work along with project report should be submitted as part of term work in eighth term on or before the last day of the eighth term.
5. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
6. Assessment of the project forward of marks shall be done by the guide and a departmental committee.
7. The guide should be internal examiner for oral examination.
8. The external examiner should be from the related area of the concerned project. He should have experience at degree level / industry.

The evaluation at final oral examination should be done jointly by the internal and external examiner

BERCHM8209	COMMUNICATION SKILLS-II	1 Credit [LTP: 0-0-2]

Course Outcomes:

On successful completion of the course the learners will be able to

CO	Cognitive Abilities	Course Outcomes
CO-01	Create	Develop the ability to identify difficult sounds, words and phrases to strengthen listening and applying these improved skills in spoken communication.
CO-02	Create	Cultivating knack for reading and writing by understanding the nuances of sentence structure and presentation style.
CO-03	Create	Demonstrate negotiation skills by identifying proper bargaining techniques and strategies for mutual gain.
CO-04	Evaluate	Determine the potential of digital communication and apply their knowledge in creating documents considering the needs of the netizens.
CO-05	Create	Propose their outlook through exposure to new and different ideas and enrich their understanding of the issues under group discussions.

UNIT NO.	UNIT NAME	HOURS
1	**Advanced Listening & Speaking Skills**	**6**
2	**Advanced Reading & Writing Skills**	**6**
3	**Art of Negotiation Skills**	**4**
4	**Email Etiquettes**	**4**
5	**Group Discussion**	**5**

LIST OF LABS	
1.	Listening Skills II: Analysis of videos/audios by famous personalities
2.	Speaking Skills II: Extempore, Debate etc.
3.	Public Speaking: Key Concepts, Overcoming Stage Fear
4.	Story-Telling Skills: Techniques of Story Telling, Prompts for story creation
5.	Situational Conversational Skills
6.	PowerPoint Presentation Skills-II
7.	Reading Skills II: Technical Writings, Research Papers & Articles
8.	Writing Skills II: Blog Writing & Review Writing
9.	Picture Perception & Discussion
10.	Art of Negotiation: Identify the qualities of successful and unsuccessful negotiators. Identify different negotiation situations to practice during class.
11.	Email Etiquettes
12.	Group Discussion: Dos & Don'ts, Informal GD

CODE: BERCEE8601 **DISCPLINEANDTALENTENRICHMENTPROGRAMME (TEP)-VIII 1CREDIT**

OVER VIEW AND OBJECTIVES:

The objective of Discipline and TEP is to provide students with the opportunities to enhance job fetching skills and at the same time to cultivate the student's personal interests and hobbies while maintaining the good disciplinary environment in the University. TEP is integrated in to the curriculum for holistic development of students through active participation in various activities falling in Technical and non-technical categories.

Discipline and Talent Enrichment Programme (TEP)–VI shall be evaluated irrespective of period / time allocation (as in the case of Extra Curricular activity) in the teachings Scheme as a One credit course. There cord related to discipline and related activities are maintained for each student and they shall be evaluated for the same also. It shall be counted in calculation of SGPA but it is not a backlog subject. However, the attendance of the classes shall be recorded and accounted in the total attendance.

Activities included in this category in the Third Semester are as follows:

CODE	ACTIVITY	HOURS	CREDITS
BERCEE8601	Online Certification Course	2	1