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 (B.Tech- Electrical and Computer Engineering)

SCHEME & SYLLABUS

BATCH 2023-2027

SCHEME & SYLLABUS

BATCH: 2023-27

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:

VISION

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

Mission

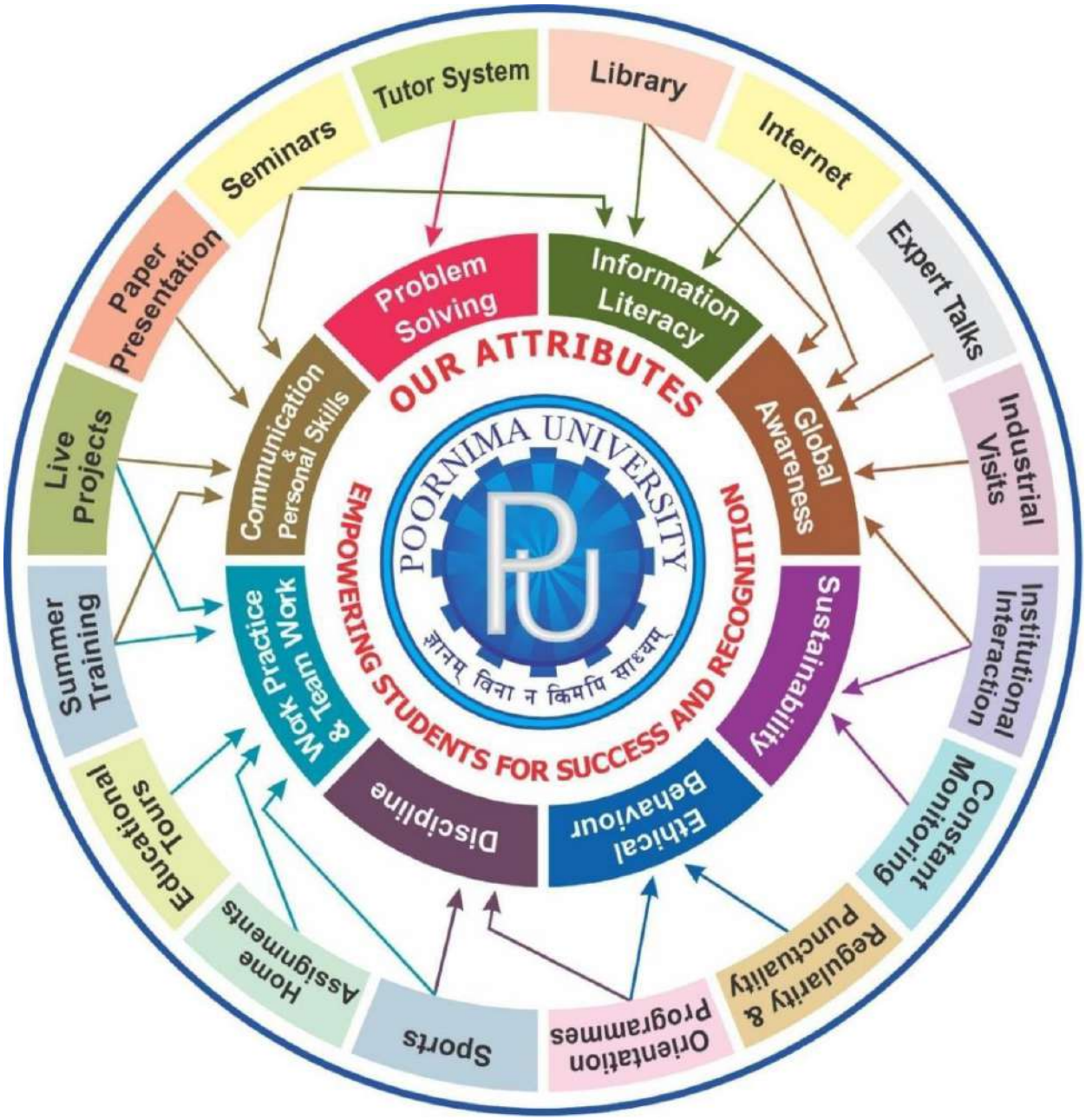
To evolve and develop skill based systems for effective delivery of knowledge so as to equip young professionals with dedication and commitment to excellence in all spheres of life.

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 aswell 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:

A. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

B. **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.

C. **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.

D. **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.

E. **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.

F. **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.

G. **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.

H. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

I. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

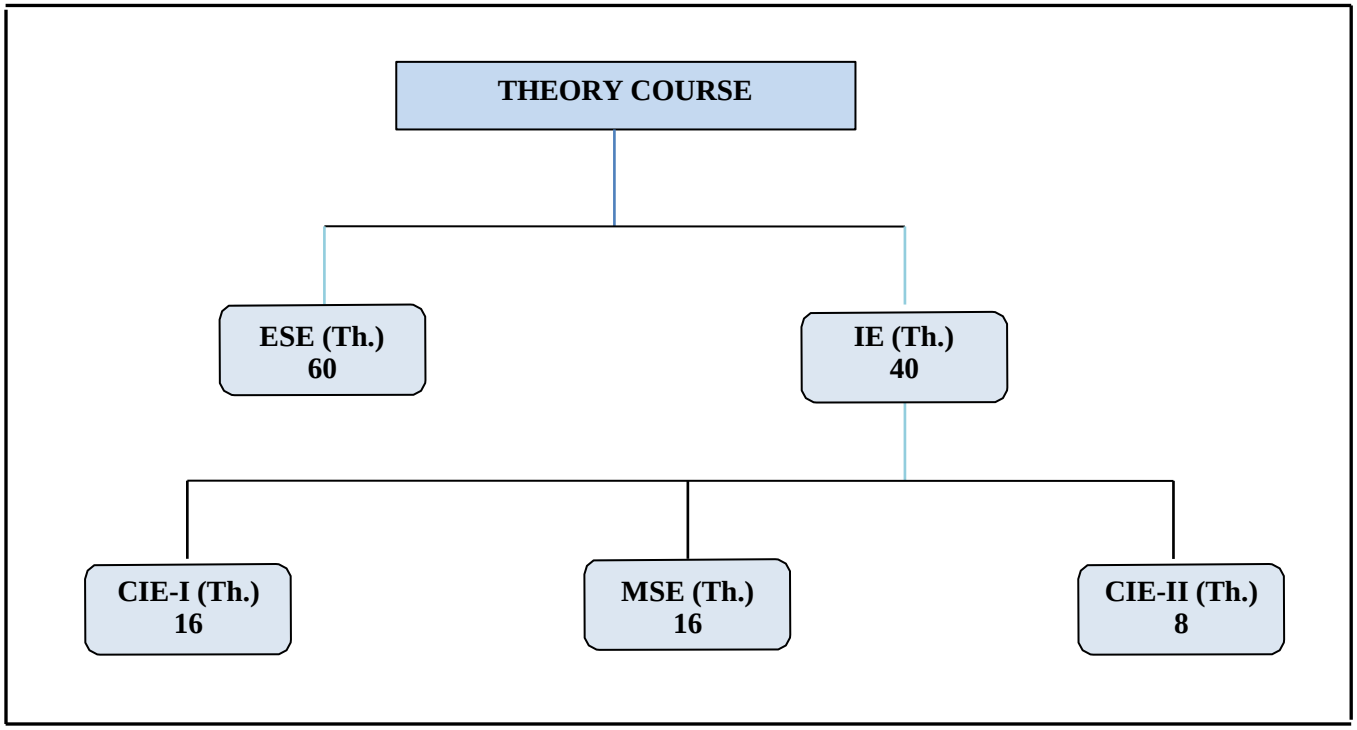
J. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

K. **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.

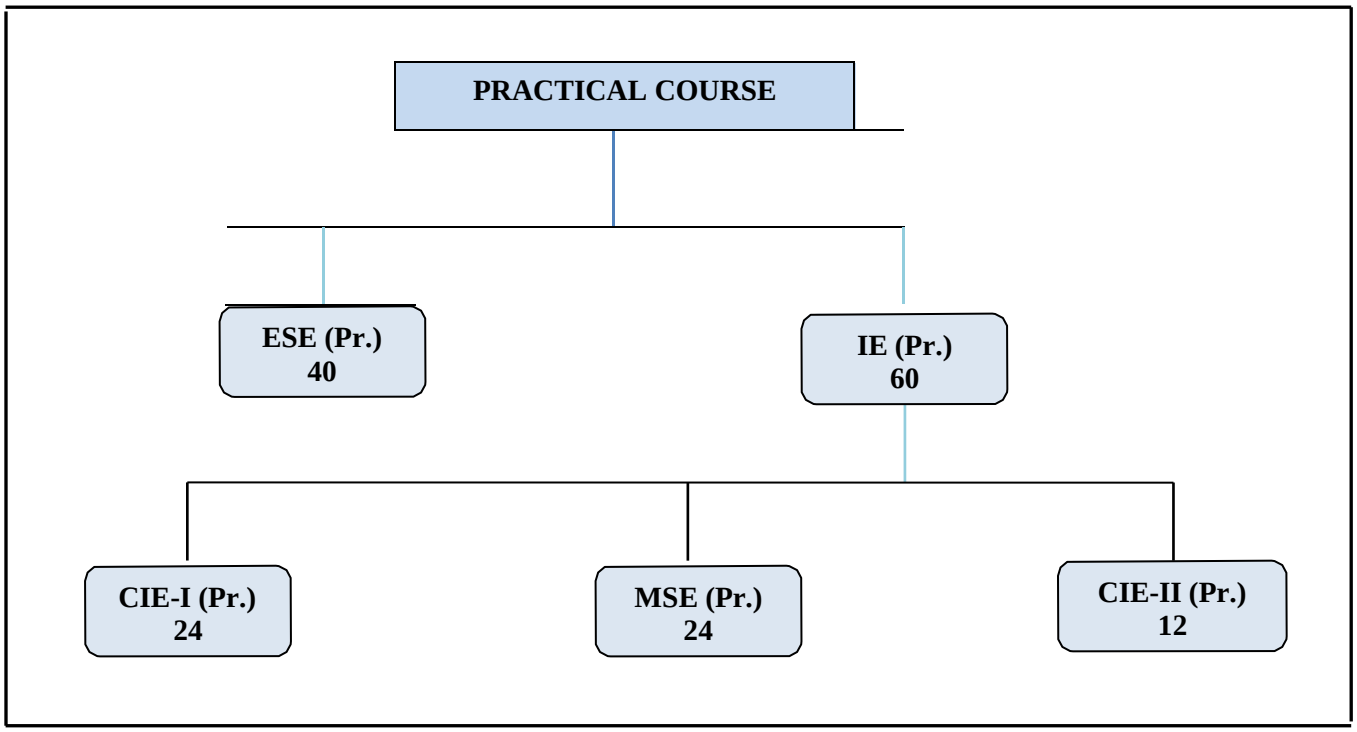
L. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Examination System :

A. **Marks Distribution of Theory Course:**



B. **Marks Distribution of Practical Course :**



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

CO Wise Marks Distribution:

Exam Entity	Theory Subject		Practical/ Studio Subject	
	Maximum Marks	CO to be Covered	CO to be Covered	Maximum Marks
CIE-I	16 (8 + 8)	1 & 2	1 & 2	24 (12 + 12)
MSE	16 (8 + 8)	3 & 4	3 & 4	24 (12 + 12)
CIE-II (Activity/ Assignment)	8 (8)	5	5	12 (12)
ESE	60	-	-	40
TOTAL	100	-	-	100

Minimum Passing Percentage in All Exams:

S No.	Program Name	Minimum Passing Percentage in		
		IE Component	ESE Component	Total Component
1	Course Work for PhD Registration	-	-	50%
2	B. Arch.	-	45%	50%
3	MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH	-	40%	40%
4	MBA, MCA, M.Des., M.Tech., M.Plan, MHA, MPH	-	35%	35%

SGPA Calculation

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

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

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

CGPA Calculation

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

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

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 of all the semesters up to which CGPA is computed

Grading Table:

Applicable for B.Arch. & Ph.D. Courses

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	90≤ x ≤100
Excellent	A+	9	80≤ x <90
Very Good	A	8	70≤ x <80
Good	B+	7	60≤ x <70
Above Average	B	6	50≤ x <60
Fail	F	0	x <50
Absent	Ab	0	Absent

Applicable for All Courses except B.Arch. & Ph.D.

Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	90≤ x ≤100
Excellent	A+	9	80≤ x <90
Very Good	A	8	70≤ x <80
Good	B+	7	60≤ x <70
Above Average	B	6	50≤ x <60
Average	C	5	40≤ x <50
Pass	P	4	35≤ x <40
Fail	F	0	x <35
Absent	Ab	0	Absent

CGPA to percentage conversion rule:

Equivalent % of Marks in the Program = *CGPA* *10

Award of Class

CGPA	Percentage	Equivalent Division
7.50 ≤ CGPA	75% or more	First Division with Distinction
6.00 ≤ CGPA < 7.50	60% ≤ x <75%	First Division
5.00 ≤ CGPA < 6.00	50% ≤ x <60%	Second Division
4.00 ≤ CGPA < 5.00	40% ≤ x < 50%	Pass Class

Guidelines for Massive Open Online Courses (MOOCs)

(Session 2023-24)

Poornima University, in its never ending endeavor to equip students with best-of-class learning and knowledge, has undertaken to include MOOC courses as part of its credit scheme from session 2023-24 onwards. The objective behind this is to enable students to study courses designed by the best teachers in the country and to scale their knowledge base with the rest of learners from the nation. The MOOCs which are included under this scheme is can be chosen from SWAYAM and NPTEL.

1. Introduction of MOOCs: SWAYAM and NPTEL

About SWAYAM:

SWAYAM is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education Policy viz., access, equity and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged. SWAYAM seeks to bridge the digital divide for students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of the knowledge economy.

This is done through a platform that facilitates hosting of all the courses, taught in classrooms to be accessed by anyone, anywhere at any time. All the courses are interactive, prepared by the best teachers in the country and are available, free of cost to any learner. However learners wanting a SWAYAM certificate should register for the final proctored exams that come at a fee and attend in-person at designated centers on specified dates. Eligibility for the certificate will be announced on the course page and learners will get certificates only if this criteria is matched.

The courses hosted on SWAYAM are in 4 quadrants – (1) video lecture, (2) specially prepared reading material that can be downloaded/printed (3) self-assessment tests through tests and quizzes and (4) an online discussion forum for clearing the doubts. Steps have been taken to enrich the learning experience by using audio-video and multi-media and state of the art pedagogy / technology.

In order to ensure that best quality content is produced and delivered, nine National Coordinators have been appointed. They are:

1. AICTE (All India Council for Technical Education) for self-paced and international courses
2. NPTEL (National Programme on Technology Enhanced Learning) for Engineering
3. UGC (University Grants Commission) for non-technical post-graduation education
4. CEC (Consortium for Educational Communication) for under-graduate education
5. NCERT (National Council of Educational Research and Training) for school education
6. NIOS (National Institute of Open Schooling) for school education
7. IGNOU (Indira Gandhi National Open University) for out-of-school students
8. IIMB (Indian Institute of Management, Bangalore) for management studies
9. NITTTR (National Institute of Technical Teachers Training and Research) for Teacher Training programme

Two types of courses are offered on SWAYAM platform: Credit Courses and Non- Credit Courses. Credit courses are offered for each semester in January and July every year. The list is available on SWAYAM official website: https://onlinecourses.swayam2.ac.in/

About NPTEL:

NPTEL (National Programme on Technology Enhanced Learning), is a joint venture of the IITs and IISc, funded by the Ministry of Education (MoE) Government of India, and was launched in 2003. Initially started as a project to take quality education to all corners of the country, NPTEL now offers close to 600+ courses for certification every semester in about 22 disciplines.

Some highlights:

- Largest online repository in the world of courses in engineering, basic sciences and selected humanities and management subjects
- YouTube channel for NPTEL – most subscribed educational channel, 1.3 billion views and 40+ lakhs subscribers

- More than 56000 hours of video content, transcribed and subtitled
- Most accessed library of peer-reviewed educational content in the world
- Translation of more than 12000 hrs of English transcripts in regional Indian languages

NPTEL Online Certification:

The objective of enabling students obtain certificates for courses is to make students employable in the industry or pursue a suitable higher education programme. Through an online portal, 4, 8, or 12-week online courses, typically on topics relevant to students in all years of higher education along with basic core courses in sciences and humanities with exposure to relevant tools and technologies, are being offered. Enrolment to and learning from these courses is free. Following these online courses, an in-person, proctored certification exam is conducted and a certificate is provided through the participating institutions and industry, as applicable.
Some statistics regarding the open online courses since March 2014 till Dec 2021
Completed courses: 3496;
Enrollments across courses: 1.58 CRORE +
Number of exam registrations: 15.1 LAKH +
All the statistics pertaining to completed courses are available at https://beta.nptel.ac.in/courses. All courses are completely free to enroll and learn from. The certification exam is optional and comes at a fee of Rs 1000/course exam.

2. MOOCs at Poornima University:

MOOCs envelops best in class teaching - learning processes along with meeting the requirements of various courses in terms of quality of teaching and evaluation system. To promote the MOOCs among students of Poornima University, it is decided to consider the credits earned through MOOCs.

(a) Options for MOOCs at Poornima University

(For this document, only those MOOCs will be considered which are available on SWAYAM & NPTEL platforms)

- Credit and Non-credit SWAYAM MOOCs can be opted by anyone, anytime, anywhere and in any language. However, prior-permission of the University Authorities is mandatory if the credits are to be transferred to regular degree.
- In case of credit courses, there are two ways to opt these courses for the purpose of credit transfer to PU system as given below:

OPTION–I: As Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards):

Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2023-24 onwards) are available at University level in offline mode for which relevant booklets are already published. **These courses carries 02 credits.** These category/type of courses (similar/different) are also available as MOOC courses. The respective Deans / HODs shall provide both the options to all the students to either select offline courses or MOOCs as per details given below:

- Deans / HODs shall prepare a list of upto 05 appropriate MOOC courses of 02/03 credits each, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.
- After approval, the respective Deans / HODs shall circulate a notice to all their respective students so that they can select any one course from the list, the credits **(only 02)** of which will be counted against Open Elective/ Multidisciplinary courses pertaining to that particular semester.
- If the students are not willing to opt for MOOC Open Elective/ Multidisciplinary course, they can proceed with the current offline practice of opting for Multidisciplinary courses.
- The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean.

OR

OPTION–II: As Major / Minor Courses:

- Deans / HODs shall identify a course of **03 credits** for each semester, well in advance (at-least 15 days prior to commencement of semester) and take approval from the Office of Dean, Academics / Pro-President, PU.
- After approval, the respective Deans / HODs shall circulate a notice to all their respective students citing that the particular course will be conducted through MOOCs only and is compulsory for all respective students. The credits of this course will be counted against Major/Minor courses pertaining to that particular semester.
- The tutor of the class shall monitor the progress (assignments, feedback, any problem etc.) on weekly basis and report to Head/Dean.
- This is to be noted that if Deans / HODs decide to conduct any major/minor course in any semester through MOOCs, no offline course will be conducted against that.

(b) Important points related to MOOCs at Poornima University

- Only one MOOC shall be allowed in a particular semester for the purpose of credit transfer in the beginning.
- No attendance will be taken for MOOC courses.
- Last period of T/T/S shall be taken for MOOC courses which shall be in self-study mode.
- The method of assessments of MOOC such as assignments and examination are completely associated with that particular MOOC and no exam will be conducted by the department as well as by the Examination Cell.
- The respective Dean / HOD must submit the detail of course i.e., code, name and credit of MOOC opted against that particular course in particular semester attached with highlighting in the related examination scheme of syllabus of that semester signed by BOS Convener / HoD and Dean of Faculty to the office of Pro-President before commencement of the classes.
- SWAYAM will award a certificate to all the students passing the examination along with the credit earned. The center of examination for SWAYAM MOOCs will be finalized by SWAYAM. All the responsibility related to registration for MOOCs, timely submission of assignments, examinations etc. will be borne by the students only.
- The list of registered students in MOOC along with name of course will be submitted to the Examination Cell by the Deans / HoDs before commencement of the classes.
- Any student who would not be able to register/present/clear/pass the MOOC in the stipulated time, it is the choice of the student that he or she may register in next semester (odd or even) with MOOC again or appear as a back exam candidate of the University as per PU norms.
- There will be no provision of re-evaluation of MOOC.
- The scorecard and related certificate of MOOC along with a consolidated list of students with marks of assignment and final exam will be submitted to the examination cell by the concerned Dean / HOD for further process. It is also recommended that alteration/changes/scaling in marks obtained by the students in any MOOC will not be considered.
- The exam registration fee of MOOC up to Max. INR 1000/- will be reimbursed to the student only after successful completion of the course in first attempt and submission of the fee receipt, score-card and certificate of the MOOC to the concerned department within stipulated time after declaration of the results.

NOTE: This is to be noted that the procedure for getting approval from BOS, Faculty Board, Academic Council and BoM is to be followed as per regular process.

Attached Items:

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

Required credits for Honors:

S.No	Program Duration	Required credits for Honors
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, JAIPUR Faculty of Engineering and Technology								
	Name of Program: B.Tech. in Electrical and Computer Engineering Duration: 4 Years **Total Credits: 174**								
	Teaching Scheme for Batch 2023-27								
	Semester-I								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical (P)**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BTXCSA1101	Basic Science for Engineers	3	-	-	1*	40	60	100	3
BTXCCE1102	Fundamental of Computer	3	-	-	1+1*	40	60	100	3
BTXCCV1103	Basics of Civil Engineering	3	-	-	1+1*	40	60	100	3
BTXCSA1105	Engineering Mathematics	3	-	-	1*	40	60	100	3
A.2	**Practical**								
BTXCSA1201	Basic Science lab	-	-	2		60	40	100	1
BTXCCE1202	Programming in C Lab		-	2		60	40	100	1
BTXCCV1203/ BTXCEE1204	Computer Aided Design (CADD)/ Basics of Electrical and Electronics Engineering Lab	-	-	2		60	40	100	1
BTXCME1205/ BTXCME1206	Workshop Practice	-	-	2		60	40	100	1
BTXCCE1207	Exploratory Project	-	-	2	2*	60	40	100	1
B.		**Minor Stream Courses/ Department Electives**							
B.1	**Theory**								
B.2	**Practical**								
	-								
C		**Multidisciplinary Courses**							
		-	-	-					
D		**Ability Enhancement Courses (AEC)**							
BULCHU1101	English	2	-	-		40	60	100	2
E		**Skill Enhancement Courses (SEC)**							
BULCSE1201	Skill Enhancement Generic Course-I	-	-	2		60	40	100	1
F		**Value Added Courses (VAC)**							
BUVCSA1102	Environmental Studies	2	-	-		40	60	100	2
G		**Summer Internship / Research Project / Dissertation**							
Total		16	0	12	2/2+6*				**22**
Total Teaching Hours		**30/36**							

SH: Supporting Hours

***Classes will be conducted fortnightly.**

	POORNIMA UNIVERSITY, JAIPUR Faculty of Engineering and Technology								
	Name of Program: B.Tech. in Electrical and Computer Engineering **Duration: 4 Years** **Total Credits: 174**								
	Teaching Scheme for Batch 2023-27								
	Semester-II								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical (P)**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BTXCCE2101	Python	3	-	-	2*	40	60	100	3
BTXCCV2102/ BTXCEE2103	Basic of Civil Engineering / Basics of Electrical and Electronics Engineering	3	-	-	1+1*	40	60	100	3
BTXCSA2104/ BTXCME2105	Engineering Mathematics / Basic of Mechanical Engineering	3	-	-	1+1*	40	60	100	3
A.2	**Practical**								
BTXCCE2201	Programming in Python Lab	-	-	2		60	40	100	1
BTXCCV2202/ BTXCEE2203	Computer Aided Design (CADD)/ Basics of Electrical and Electronics Engineering Lab	-	-	2		60	40	100	1
BTXCME1205/ BTXCME1206	Workshop Practice/Engineering Graphics	-	-	2		60	40	100	1
BTXCCE1207	Exploratory Project	-	-	2	2*	60	40	100	1
B.		Minor Stream Courses/ **Department Electives**							
B.1	**Theory (Any One)**								
BTXECE2111 BTXECE2112 BTXECE2113 BTXECE2114 BTXEME2116 BTXECE2115	• Introduction to AI&DS • Introduction to Cyber Security • Introduction to Cloud • Introduction to Game Tech. • Engineering Mechanics • Digital Electronics	3	-	-		40	60	100	3
B.2	**Practical**								
C		**Multidisciplinary Courses**							
BTXEBX2109	MOOC Course-I (Human Behaviour)	2	0	0					2
D		**Ability Enhancement Courses (AEC)**							
BULCHU2204	Language Lab	0	0	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
BULCSE2201	Skill Enhancement Generic Course-II	-	-	2		60	40	100	1
F		**Value Added Courses (VAC)**							
BUVCPH2102	Health Behaviour & Communication	2	-	-		40	60	100	2
G		**Summer Internship / Research Project / Dissertation**							
		-	-	-					
Total		16	-	12	2/2+6*				**22**
Total Teaching Hours		**30/36**							

SH: Supporting Hours

***Classes will be conducted fortnightly.**

	POORNIMA UNIVERSITY, JAIPUR Faculty of Engineering and Technology								
	Name of Program: B.Tech. in Electrical and Computer Engineering **Duration: 4 Years** **Total Credits: 174**								
	Teaching Scheme for Batch 2023-27								
	Semester-III								
Course Code	**Name of Course**	**Teaching Scheme**			**SH**	**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical (P)**		**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BERCSA3101	Engineering Mathematics - II	3	0	0	1*	40	60	100	3
BERCEE3102	Electrical Machines	3	0	0	1*	40	60	100	3
BERCEE3103	Electronic Measurement and Instrumentation	3	0	0	1*	40	60	100	3
A.2	**Practical**								
BERCEE3201	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	Technical Seminar	0	0	2	2*	60	40	100	1
BERCEE3205	Introduction to MATLAB	0	0	2		60	40	100	1
B.		Minor Stream Courses / **Department Electives**							
B.1	**Theory (Any one)**								
BEREEE3111	Analog and Digital Circuits	3	0	0	1*	40	60	100	3
BERECE3112	Data Structure								
BEREEE3113	Renewable and Alternate Energy								
B.2	**Practical**								
	-								
C		**Multidisciplinary Courses**							
BEREBX3109	MOOC Course-II	2	0	0					2
D		**Ability Enhancement Courses (AEC)**							
BULCHU3106	Interpersonal Communication & Grooming	0	0	2		40	60	100	2
E		**Skill Enhancement Courses (SEC)**							
BULCSE3201	Skill Enhancement Generic Course-III	0	0	2		60	40	100	1
F		**Value Added Courses (VAC)**							
BUVCCE3101	Digital Marketing	2	0	0		40	60	100	2
G		**Summer Internship / Research Project / Dissertation**							
	-	16		14	6*				**24**
Total Teaching Hours		**30/36**							

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	POORNIMA UNIVERSITY, JAIPUR Faculty of Engineering and Technology								
	Name of Program: B.Tech. in Electrical and Computer Engineering **Duration: 4 Years** **Total Credits: 174**								
	Teaching Scheme for Batch 2023-27								
	Semester-IV								
Course Code	**Name of Course**	**Teaching Scheme**			**SH**	**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical (P)**		**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BERCEE4101	Electrical Circuit and Analysis	3	1	0		40	60	100	4
BERCEE4102	Control Systems	3	0	0	1*	40	60	100	3
BERCCE4103	Computer Networks	3	0	0	1*	40	60	100	3
BERCEE4104	Electronic Device and Circuit	3	0	0	1*	40	60	100	3
A.2	**Practical**								
BERCEE4201	Control and	0	0	2		60	40	100	1
BERCCE4202	OOPS LAB	0	0	2	1*	60	40	100	1
BERCCE4203	Computer Networks	0	0	2	1*	60	40	100	1
	Minor Stream Courses / **Department Electives**								
B.1	**Theory**								
BERECE4111	Object Oriented Programming	3	0	0	1*	40	60	100	3
BERECE4112	Operating Systems								
BEREEE4113	Energy and Environmen								
B.2	**Practical**								
C		**Multidisciplinary Courses (MC)**							
BEREBX4109	MOOC Course-III (Fundamentals of Marketing-I)	2	0	0		40	60	100	2
D		**Ability Enhancement Courses (AEC)**							
BULCHU4109	Negotiation Skills & Persuasive Communication	0	0	2		60	40	100	2
E		**Skill Enhancement Courses (SEC)**							
BULCSE4201	Skill Enhancement Generic Course-IV	0	0	2		60	40	100	1
BERCSE4202	Skill Enhancement Technical Course-I	0	0	2		60	40	100	2
F		**Value Added Courses (VAC)**							
	-	-	-	-					
G		**Summer Internship / Research Project / Dissertation**							
Total		17	1	12	6*				**26**
Total Teaching Hours		**30/36**							

SH: Supporting Hours
***Classes will be conducted fortnightly.**

	POORNIMA UNIVERSITY, JAIPUR Faculty of Engineering and Technology								
	Name of Program: B.Tech. in Electrical and Computer Engineering **Duration: 4 years** **Total Credits: 174**								
	Teaching Scheme for Batch 2023-27								
	Semester-V								
Course Code	**Name of Course**	**Teaching Scheme**			**SH**	**Marks Distribution**			**Credits**
		Lecture	**Tutorial (T)**	**Practical (P)**		**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BERCEE5101	Electrical Power Generation, Transmission and Distribution	3	0	0	1*	40	60	100	3
BERCEE5102	Power Electronics and Drives	3	0	0	1*	40	60	100	3
BERCCE5103	Microprocessor and Microcontrollers	3	0	0	1*	40	60	100	3
BERCCE5104	Artificial Intelligence & Expert System	3	0	0	1*	40	60	100	3
A.2	**Practical**								
BERCCE5201	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	Electric Vehicle Lab	0	0	2		60	40	100	1
BERCEE5204	Industrial Technical Seminar-I	0	0	2		60	40	100	1
B.		Minor Stream Courses **/ Department Electives**							
B.1	**Theory (Any One)**								
BEREEE5111	Solar Thermal and PV	3	0	0	1*	40	60	100	3
BEREEE5112	Hydrogen Energy and Fuel Cells								
BEREEE5113	Switchgear and Protection of								
B.2	**Practical**								
C		**Multidisciplinary Courses**							
BEREBX5109	MOOC Course-IV (Fundamental of Marketing –II)	2	0	0					2
D		**Ability Enhancement Courses (AEC)**							
BULCHU5115	Entrepreneurial & Managerial Skills	0	0	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
BULCSE5201	Skill Enhancement Generic Course-V	0	0	2		60	40	100	1
BULCSE5202	Skill Enhancement Generic Course-VI	0	0	2		60	40	100	1
F		**Value Added Courses (VAC)**							
		-	-	-					
G		**Summer Internship / Research Project / Dissertation**							
Total		17	0	14	5*				
Total Teaching Hours		**30/36**							**24**

SH: Supporting Hours
***Classes will be conducted fortnightly.**

POORNIMA UNIVERSITY, JAIPUR

Faculty of Engineering and Technology

Name of Program: B.Tech. in Electrical and Computer Engineering **Duration: 4 Years**

Total Credits: 174

Teaching Scheme for Batch 2023-27

Semester-VI

Course Code	Name of Course	Teaching Scheme			SH	Marks Distribution			Credits
		Lecture (L)	Tutorial (T)	Practical (P)		IE	ESE	Total	
A.		**Major (Core Courses)**							
A.1	Theory								
BERCEE6101	MOOC Course (As Described in Annexure-II)	3	0	0		40	60	100	3
A.2	Practical								
BERCEE6201	Industrial Technical Seminar-II	0	0	4		60	40	100	2
B.		**Minor Stream Courses / Department Electives**							
B.1	Theory								
	-								
B.2	Practical								
	-								
C		**Multidisciplinary Courses**							
	-	-	-	-					
D		**Ability Enhancement Courses (AEC)**							
	-	-	-	-					
E		**Skill Enhancement Courses (SEC)**							
	-	-	-	-					
F		**Value Added Courses (VAC)**							
	-	-	-	-					
G		**Summer Internship / Research Project / Dissertation**							
BERCEE6401	Internship	0	0	12		40	60	100	6
Total		3	0	16					**11**
Total Teaching Hours		**19**							

SH: Supporting Hours

***Classes will be conducted fortnightly.**

	POORNIMA UNIVERSITY, JAIPUR Faculty of Engineering and Technology								
	Name of Program: B.Tech. in Electrical and Computer Engineering **Duration: 4 Years** **Total Credits: 174**								
	Teaching Scheme for Batch 2023-27								
	Semester-VII								
Course Code	**Name of Course**	**Teaching Scheme**			**SH**	**Marks Distribution**			**Credits**
		Lecture	**Tutorial (T)**	**Practical (P)**		**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BERCCE7101	Theory and Practical Aspect of Machine Learning	3	0	0		40	60	100	3
BERCEE7102	Power System Analysis	3	1	0	1*	40	60	100	4
BERCCE7103	Data Base management	3	0	0	1*	40	60	100	3
BERCCE7104	Computational Theory and Compiler Design	3	0	0	0	40	60	100	3
A.2	**Practical**								
BERCEE7201	Power System Lab	0	0	2		60	40	100	1
BERCCE7202	Natural Language processing	0	0	2	1*	60	40	100	1
BERCER7203	DBMS Lab	0	0	2		60	40	100	1
BERCCE7204	Compiler Design Lab	0	0	2		60	40	100	1
BERCEE7205	FACT Devices Lab	0	0	2		60	40	100	1
B.		Minor Stream Courses**/ Department Electives**							
B.1	**Theory (Any One)**								
BEREEE7111	Solar Thermal Engineering Processes								
BEREEE7112	EHV AC/DC Transmission								
BERECE7113	Electronics Circuits for								
B.2	**Practical**								
	-								
C		**Multidisciplinary Courses**							
D		**Ability Enhancement Courses (AEC)**							
		-	-	-					
E		**Skill Enhancement Courses (SEC)**							
	-	-	-	-					
F		**Value Added Courses (VAC)**							
	-	-	-	-					
G		**Summer Internship / Research Project / Dissertation**							
BERCEE7301	Minor Project	0	0	4	3*	60	40	100	2
Total		15	1	14	6*				**23**
Total Teaching Hours		**30 / 36**							

SH: Supporting Hours
***Classes will be conducted fortnightly.**

	POORNIMA UNIVERSITY, JAIPUR Faculty of Engineering and Technology								
	Name of Program: B.Tech. in Electrical and Computer Engineering **Duration: 4 Years** **Total Credits: 174**								
	Teaching Scheme for Batch 2023-27								
	Semester-VIII								
Course Code	**Name of Course**	**Teaching Scheme**			**SH**	**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical (P)**		**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BERCEE8101	Power System Restructuring and Smart	3	0	0		40	60	100	3
BERCCE8102	Digital Image Processing	3	0	0	1*	40	60	100	3
A.2	**Practical**								
BERCEE8201	Energy System Lab	0	0	2		60	40	100	1
BERCEE8202	Academic Research Paper Writing and IPR	0	0	2		60	40	100	1
BERCCE8203	Computer Vision Lab	0	0	2		60	40	100	1
B.		Minor Stream Courses/**Department Electives**							
B.1	**Theory**								
BERECE8111	Optimization Theory	3	0	0		40	60	100	3
BEREEE8112	Power System operation and								
BERECE8113	Wireless Sensor Network								
B.2	**Practical**								
C		**Multidisciplinary Courses**							
		-	-	-					
D		**Ability Enhancement Courses (AEC)**							
		-	-	-					
E		**Skill Enhancement Courses (SEC)**							
		-	-	-					
F		**Value Added Courses (VAC)**							
		-	-	-					
G		**Summer Internship / Research Project / Dissertation**							
BERCEE8301	Major Project			20		60	40	100	10
Total		9		26	1				**22**
Total Teaching Hours		**30/36**							

SH: Supporting Hours

***Classes will be conducted fortnightly.**

	POORNIMA UNIVERSITY, JAIPUR Faculty of Engineering and Technology								
	Name of Program: B.Tech. in B.Tech. in Electrical and Computer Engineering Duration: 4 Years **Total Credits: 174**								
	Teaching Scheme for Batch 2023-27								
	Semester-I								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical (P)**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BTXCSA1101	Basic Science for Engineers	3	-	-	1*	40	60	100	3
BTXCCE1102	Fundamental of Computer	3	-	-	1+1*	40	60	100	3
BTXCCV1103	Basics of Civil Engineering	3	-	-	1+1*	40	60	100	3
BTXCSA1105	Engineering Mathematics	3	-	-	1*	40	60	100	3
A.2	**Practical**								
BTXCSA1201	Basic Science lab	-	-	2		60	40	100	1
BTXCCE1202	Programming in C Lab		-	2		60	40	100	1
BTXCCV1203/ BTXCEE1204	Computer Aided Design (CADD)/ Basics of Electrical and Electronics Engineering Lab	-	-	2		60	40	100	1
BTXCME1205/ BTXCME1206	Workshop Practice	-	-	2		60	40	100	1
BTXCCE1207	Exploratory Project	-	-	2	2*	60	40	100	1
B.		**Minor Stream Courses/ Department Electives**							
B.1	**Theory**								
B.2	**Practical**								
	-								
C		**Multidisciplinary Courses**							
		-	-	-					
D		**Ability Enhancement Courses (AEC)**							
BULCHU1101	English	2	-	-		40	60	100	2
E		**Skill Enhancement Courses (SEC)**							
BULCSE1201	Skill Enhancement Generic Course-I	-	-	2		60	40	100	1
F		**Value Added Courses (VAC)**							
BUVCSA1102	Environmental Studies	2	-	-		40	60	100	2
G		**Summer Internship / Research Project / Dissertation**							
Total		16	0	12	2/2+6*				**22**
Total Teaching Hours		**30/36**							

SH: Supporting Hours
***Classes will be conducted fortnightly..**

BTXCSA1101	Basic Science for Engineers	3 Credits [LTP: 3-0-0]

COURSE OUTCOMES

The Students will be able

CO1.Point out the basic principles of relativity, twin paradox and energy-mass relations

CO2.Produce coherent sources and phenomenon of interference

CO3To learn about the laser and apply it for suitable applications manufacturing of cement and the chemistry involved in setting and hardening of it.

CO4 To use their knowledge of polymers and its use in industries and daily life.

CO5To develop innovative methods to produce soft water for industrial use and potable water at cheaper cost

A.OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Special Theory of Relativity	7
2.	Wave Optics	7
3.	Laser & Binding Materials	8
4.	Polymer	8
5.	Water Technology	6

B.DETAILED SYLLABUS

Unit	Unit Details
1.	**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 and Time Dilation. • Relativistic Mass-Energy relation • Conclusion of Unit
2.	**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 • Conclusion of Unit
3.	**Laser & Binding Materials**
	• 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 • 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 • Conclusion of Unit
4.	**Polymer**
	• Introduction of Unit • Classification of Polymers and Types of polymerization • Plastics: Constituents of plastics, Thermosets and Thermoplastics, Preparation, Properties and Uses of Polyethylene, Bakelite, Teflon and Nylon • Elastomers: Natural rubber, Vulcanization, Synthetic rubber- Preparation, Properties and Applications of SBR, Buna-N, Butyl and Neoprene rubber • Conclusion of Unit

5.	**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. • Treatment of hard water: Lime-soda method, Permutit (zeolite) method and Deionization or Demineralization method • Desalination: Reverse osmosis, Electrodialysis • Conclusion of Unit

C.RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Fundamental of Optics	Jenkins and While	4th	Tata McGraw-Hill
2.	Optics	Ajoy Ghatak	3rd	Tata McGraw-Hill
3.	Introduction to special Theory of Relativity	R. Resnick	Latest	Johan Willy Singapore
4.	Engineering Chemistry	P.C. Jain	Latest	Dhanpat Rai&Sons
5.	Engineering Chemistry	S. S. Dara	Latest	S. Chand & Co

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**3**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO3	**2**	**2**	**1**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**1**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO5	**2**	**2**	**1**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	2	-	-
CO4	2	-	-
CO5	2	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

BTXCCE1102	Fundamental of Computer	3 Credits [LTP: 3-0-0]

Course Outcomes: -

Students will be able to:

- Learn data types, loops, functions, array, pointers, string, structures and files.
- Develop conditional and iterative statements to write C programs.
- Implement concept of string using array.
- Allocate memory dynamically using pointers.
- Apply C Programming to solve real time problems.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	**Introduction to C Programming**	6
2.	**Decision Making & Looping**	6
3.	**Array and string**	8
4.	**Advance programming in C**	8
5.	**File handling & Additional features**	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to C Programming**
	• Introduction of Unit • Introduction to computer-based problem solving, Program design and implementation issues- Flowcharts & Algorithms. • Types of Languages – Machine language, assembly language, high level languages, Assemblers, Compilers, Interpreters. • Overview of C, Data Types, Constants & Variables, Literals, Operators & Expressions • Conclusion &Real Life Application
2.	**Decision Making & Looping**
	• Introduction of Unit • Decision making in C- if statement, if-else statement, Nested if statement, if else if Ladder, Switch case • Loop control in C – for loop, while loop • Control flow in C- break, continue and goto statement. • Conclusion &Real Life Application
3.	**Array and string**
	• Introduction of Unit • Array- 1D array, 2D array • Scope rules- Local & global variables. • Functions-parameter passing call by value and call by reference, calling functions with arrays, command line argument. • String – String in-build functions. • Conclusion of the Unit
4.	**Advance programming in C**
	• Introduction of Unit • Pointers- The & and * operator, pointer expression, assignments, arithmetic, comparison, arrays of pointers, pointers to pointers, initializing pointers, pointers to functions. • Structures- Basics, declaring, referencing structure elements, array of structures, passing structures to functions, structure pointers. • Conclusion of the Unit

5.	File handling & Additional features
	• Introduction of Unit • File Handling – The file pointer, file accessing functions-fopen, fclose, putc, getc, fprintf, reading and writing into a file • Advance features- storage classes and dynamic memory allocation • C Preprocessor- #define, #include, #undef. • C standard library and header files: Header files, string functions, mathematical functions, Date and Time functions. • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Letus C, 6th Edition	Yashwant Kanitkar	PBP Publication	Letus C ,6th Edition
2.	The C programming Language	Richie and Kenninghan	BPBPublication,2004	The C programming Language
3.	Programming in ANSI C3rd Edition, 2005	E.Balagurusamy	Tata McGraw Hill	Programming in ANSIC 3rd Edition, 2005
Reference Book				
1.	The C programming Language Richie and Kenninghan PBP Publication,2004			
2.	Programming in ANSI C 3rd Edition, 2005 Balaguruswmy Tata McGraw Hill			
Online Resources				
1.	https://www.programiz.com/c-programming/examples			
2.	https://www.w3resource.com/c-programming-exercises			

Code: BTXCCV1103 Basics of Civil Engineering 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

The student will be able to:

CO1 Understand the importance and use of Engineering Materials

CO2 Apply the knowledge of material and elements in Building Construction.

CO3 Understand the importance of irrigation and water supply.

CO4 Apply the basic knowledge of mathematics and material to learn surveying and roads.

CO5 Understand the importance of Indian Standard Codes.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Civil Engineering Materials**	8
2.	**Introduction to Building Construction**	8
3.	**Irrigation and Water Supply**	7
4.	**Survey and Highway Engineering**	8
5.	**Introduction to Indian Standards Codes**	7

B. **DETAILED SYLLABUS**

Unit	Unit Details
1.	**Civil Engineering Materials**
	• Traditional Material Introduction (Stones, Bricks, Lime, Cement, Timber) – Characteristics and their uses only • Mortar – Introduction, their Types (Cement Mortar, Lime Mortar, Mud Mortar, Special Mortar) and use. • Concrete – Introduction their Types (Plain Concrete, Reinforced Cement Concrete, Prestressed Concrete, Fiber Reinforced Concrete).
2.	**Introduction to Building Construction**
	• Introduction to Elements of Building • Foundation, their importance and their types. • Dampness and its Prevention. (Cause, ill effects and its solution).
3.	**Irrigation and Water Supply**
	• Definition and classification of irrigation – Irrigation structures – dams, weirs, cross drainage works, canal drops. Quality of water-Treatment methods
4.	**Survey and Highway Engineering**
	• Introduction to Surveying. • Instruments of Surveying and their uses, Linear Measurements, Insight to modern tools of Surveying (Auto Level, Theodolite, GPS) function only. • Introduction to Highway Engineering, Classification of Roads, Components of Highway, Super Elevation, Types of Pavements.
5.	**Introduction to Indian Standards Codes**
	• Introduction to IS codes for Building Deign (IS456:2000, IS800-2007, IS875 All Parts, IS1893:2016, IS13920)

C. RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1.	Basics of Civil Engineering	S.S. Bhavikatti	Latest	New Age International Publishers
2.	Basic Civil Engineering	B C Punmia, Ashok K Jain, Arun K Jain	Latest	Laxmi Publications
3.	Basic Civil Engineering	G K Hiraska	Latest	Dhanpat Rai Publication
4.	Basic Civil Engineering	Jhonson Victor D and Esther Malini	Latest	Allied Publishers Limited, Madras
5.	Basic Civil Engineering	Arunachalam N	Latest	Pratheeba Publishers, Coimbatore

Important Web Links	
1.	https://nptel.ac.in/courses/105106201
2.	https://onlinecourses.nptel.ac.in/noc20_ce02/preview

D. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	2	1	–	–	–	–	–	–	–	–
CO-2	2	3	1	2	–	–	–	–	–	–	–	–
CO-3	3	2	2	2	–	–	–	–	–	–	–	–
CO-4	3	3	1	2	–	–	–	–	–	–	–	–
CO-5	3	3	2	2	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	–	3
CO-2	2	–	3
CO-3	1	–	3
CO-4	1	–	3
CO-5	2	–	3

Code: BTXCSA1105	Engineering Mathematics	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

The student would be able:

CO1 To analyze and prove relationships between matrices, rank of matrix and systems of equations, Inverses.

CO2To analyze the basic structure of differential equations, and order and degree of the first order and first degree and its simple applications

CO3 To calculate asymptotes of different curves. They will be able to know fundamentals of tracing the various types of cures and asymptotes play a main role in tracing.

CO4To utilize methods of integration to evaluate volumes and surface of objects and lengths of curves.

CO5To apply vector differentiation, and integration in the scalar and vector fields

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1	Matrices	7
2	Ordinary Differential Equations	8
3	Applications of Differential Calculus	8
4	Integral Calculus	8
5	Introduction 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, • Homogenous and reducible to homogenous equation • Linear Equation and reducible to linear form, Exact Equation • Linear differential equations with constant coefficients • Conclusion of Unit
3.	**Applications of Differential Calculus**
	• Introduction of Unit • Asymptotes • Multiple points • Curve tracing for standard Curves (Cartesian Curves only) • Conclusion & Real life applications
4.	**Integral Calculus**
	• Introduction of Unit • Gamma functions and their properties, beta function (only definition) • Double integrals, Double integral by changing into polar form, Areas by Double Integration • Change of order of integration • Conclusion of Unit
5.	**Vector Calculus**
	• Introduction of Unit • Scalar and Vector field • Differentiation and Integration of Vector functions • Gradient, Divergence and Curl, Directional derivatives • 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			

D. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	–	–	–	–	–	–	–	–
CO-2	3	2	1	2	–	–	–	–	–	–	–	–
CO-3	2	3	2	1	–	–	–	–	–	–	–	–
CO-4	2	2	2	1	–	–	–	–	–	–	–	–
CO-5	2	3	1	1	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	–	–
CO-2	2	–	–
CO-3	1	–	–
CO-4	2	–	–
CO-5	2	–	–

Code: BTXCSA1201	Basic Science lab	3 Credits [LTP: 3-0-0]

COURSE OUTCOMES

Students will be able:

CO1: Learn the concept of interference by the help of Newton's ring & Michelson Interferometer
CO2: Learn the dispersive power of the material of the prism & resolving power of the telescope
CO3: To analyze hardness strength of Ferrous Ammonium sulphate solution and $CuSO_4$ solution.
CO4: To analyze hardness of water
CO5:To handle different instruments & analytical techniques

A. LISTOFEXPERIMENTS:

1	To determine the wavelength of sodium light by using Newton's Ring.
2	To determine the coherent length and coherent time by using He-Ne-Laser.
3	To measure the numerical aperture of an optical fiber by He-Ne laser.
4	To determine the wavelength of prominent lines of mercury by plane diffraction grating with the help of spectrometer.
5	To specify the specific resistance of a material of a wire by carey Foster Bridge.
6	To determine the dispersive power of a prism for violet, yellow and red colour of mercery light with the help of spectrometer
7	To determine the strength of $CuSO_4$ solution with the help of hypo solution
8	To determine the strength of Ferrous Ammonium sulphate solution with the help of $K_2Cr_2O_7$ solution using diphenyl amine as internal indicator
9	To determine the hardness of water by EDTA method.
10	Synthesis of Bakelite
11	To determine the viscosity of a given lubricating oil by Redwood viscometer
12	To determine the flash and fire point of a given lubricating oil

B. MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**3**	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**2**	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO4	**2**	**1**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**1**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**

C. MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXCCE1202	Programming in C Lab	3 Credits [LTP: 3-0-0]

COURSE OUTCOME: -

Students will be able to:

- Gain concept of functional hierarchical code organization.
- Work with textual information, characters and strings
- Implement file handling concepts
- Implement real time applications using the power of C language features.
- Overcome and solve possible errors during program execution.

A. LIST OF EXPERIMENTS:

1	Given the values of the variables x, y and z, write a program to rotate their values such that x has the value of y, y has the value of z, and z has the value of x
2	Write a program that reads a floating point number and then displays the right-most digit of the integral part of the number.
3	Write a C program to calculate the sum of digits of given number.
4	Program to find largest and smallest number from four given number.
5	Program to find whether a year is leap or not
6	Write a C program in which enter any number by the user and perform the operation of Sum of digits of entered number.
7	Write a C Program to convert Decimal number to Binary number
8	Find the sum of this series upto n terms 1+2+3+4+5+6+……..
9	Program to print Armstrong's numbers from 1 to 100.
10	Write a program to convert years into Minute, Hours, Days, Months, Seconds using switch () statements
11	Write a C menu driven program
12	Write a program to generate the various pattern of numbers
13	Write a C Program to print the reverse of an integer number
14	Write a C program to perform the factorial of given number
15	Write a C program in which a function prime that returns 1 if its argument is a prime and return zero otherwise.
16	Write a C program to calculate factorial of a number using recursion.
17	Write a C program in which enter 10 elements by the user and perform the operation of sorting in ascending order
18	Write a C program to perform to perform Matrix addition and multiplication operations.
19	Write a program to determine the length of the string and find its equivalent ASCII codes.
20	Write a program to delete all the occurrences of the vowels in a given text. Assume that the text length will be of one line
21	Write a program to maintain the library record for 100 books with book name, author's name, and edition, year of publishing and price of the book.

B. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
	Let us C	Yashwant Kanetkar	6th Edition	PBP Publication
	The C programming Language	Richie and Kenninghan	2nd Edition 2004	PBP Publication,2004
	Programming in ANSI C	E Balaguruswamy	3rd Edition, 2005	Tata McGraw Hill
Reference Book				
	The C programming Language by Richie and Kenninghan, PBP Publication,2004			
	Programming in ANSI C 3rd Edition, 2005 by E.Balagurusamy, Tata McGraw Hill			

Online Resources	
	https://www.programiz.com/c-programming/examples
	https://www.w3resource.com/c-programming-exercises

MAPPING OF COURSE OUTOCMES WITH PROGRAMME OUTCOMES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**3**	**3**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**2**	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO4	**2**	**1**	**1**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**1**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**

MAPPING OF COURSE OUTOCMES WITH PROGRAMME SPECIFIC OUTCOMES

	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

Code: BTXCCV1203	Computer Aided Design (CADD)	1Credits [LTP:0-0-1]

COURSE OUTCOMES:-

Students will be able to:

CO1 Apply basic concepts to develop construction (drawing) techniques.
CO2 Analyze drawings through editing and plotting techniques
CO3 Apply basic tools to develop outlines in drawings.
CO4 Apply tools to control and manage the drawings in AutoCAD for different purposes
CO5 Create the layout of plans in workspace.

A. LIST OF EXPERIMENTS

1.	• Introduction to AutoCAD and Drawing Tools • Draw Different Shapes using Line, Polyline Circle, and Polygon.
2.	• Draw Different Shapes using Rectangle • Use of Dimensions in Circle, rectangles, Line and other shapes.
3.	• Modify Drawings in AutoCAD using Modification Tools. • Offset and Mirror Different Shapes and Lines.
4.	• Use Trim, Extend &Align, Scale and Strech Command.
5.	• Use of Text, Line, Block and Conversion Tools.
6.	• Introduction to Layers, How to add, Modify layers in layer manager.
7.	• Introduction of Hatch Command in AutoCAD
8.	• Opening and Modifying properties in AutoCAD.
9.	• Layout Design of Building
10.	• 2D Plan of Residential Structure

B. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	2	1	–	–	–	–	–	–	–	–
CO-2	2	3	1	2	–	–	–	–	–	–	–	–
CO-3	3	2	2	2	–	–	–	–	–	–	–	–
CO-4	3	3	1	2	–	–	–	–	–	–	–	–
CO-5	3	3	2	2	–	–	–	–	–	–	–	–

C. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	–	3
CO-2	2	–	3
CO-3	1	–	3
CO-4	1	–	3
CO-5	2	–	3

Code: BTXCME1205	WORKSHOP PRACTICE	1 Credit [LTP: 0-1-2]

COURSE OUTCOMES:-

Students will be able to:

CO1 Create a model of T Lap and T- Briddle Joint through carpentry shop
CO2 Analyze the making of prototype model through foundry shop
CO3 Analyze the difference between gas welding and arc welding and their applications
CO4 Create a model on fitting shop through filling, drilling and tapping operation
CO5 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

B. List of Jobs to be made in the Workshop Practice

1.	**Carpentry Shop** 1. T – Lap joint 2. Bridle joint
2.	**Foundry Shop** 3. Mould of any pattern
3.	**Welding Shop** 4. Square butt joint by MMA welding 5. Lap joint by MMA welding
4.	**Machine Shop Practice** 6. Job on lathe with facing operation 7. Job on lathe with one step turning and chamfering operations 8. Job on shaper for finishing two sides of a job
5.	**Fitting Shop** 9. Finishing of two sides of a square piece by filing 10. Drilling operation on fitted job (two holes) 11. Slotting operation on fitted job 12. Tapping operation on fitted job

C. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	2	1	–	–	–	–	–	–	–	–
CO-2	2	3	1	2	–	–	–	–	–	–	–	–
CO-3	3	2	2	2	–	–	–	–	–	–	–	–
CO-4	3	3	1	2	–	–	–	–	–	–	–	–
CO-5	3	3	2	2	–	–	–	–	–	–	–	–

D. C0-PSO's

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	–	3
CO-2	2	–	3
CO-3	1	–	3
CO-4	1	–	3
CO-5	2	–	3

Code: BTXCME1106	Engineering Graphics	1 Credit [LTP: 1-0-2]

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

CO5 analyze the development of surface and analyze the sheet metal requirement for fabricating a surface.

A. List of Experiments

1.	• Lines, Lettering and Dimension (Sketch Book) • Scales: Representative Fraction, plain scales, diagonal scales, (In drawing sheet 1)
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 2)
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 3)
4.	• Orthographic Projections (3 Problems in drawing sheet 4)
5.	Sectional Views (2 Problems) and Riveted joints, lap joints, butt joints, chain riveting (drawing sheet 5)

B. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	2	1	–	–	–	–	–	–	–	–
CO-2	2	3	1	2	–	–	–	–	–	–	–	–
CO-3	3	2	2	2	–	–	–	–	–	–	–	–
CO-4	3	3	1	2	–	–	–	–	–	–	–	–
CO-5	3	3	2	2	–	–	–	–	–	–	–	–

C. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	–	3
CO-2	2	–	3
CO-3	1	–	3
CO-4	1	–	3
CO-5	2	–	3

Code: BTXCEE1207	Exploratory Project	1 Credits [LTP: 0-0-1]

LAB 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

GUIDELINES:

1. The Project group must 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 first term on or before the last day of the second 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.

Phases:

Project work is divided into the following phases:

Phase I

- Allocation of groups(Max. 4 Members & Min. 2 Members) & guide
- Black board presentation on topics as per the choice & feasibility
- Submission of abstract & synopsis of the project

Phase II

- Procurement of the components
- 2D/3D figure or model
- Paper work like any circuit diagram and tentative cost

Phase III

- Working Model of the project
- Mounting the components
- Final hardware evaluation/presentation
- Submission of the final hardware to the coordinator.

Phase V

- Final report submission (after project exhibition)
- Paper presentation on the selected project in seminars /conferences/journals
- Viva voce

Deadlines of Phases:

The Project will be covered in 13 weeks from starting of semester. The time allocated to each phase is as follow:

Phase -1: Maximum 2 weeks

Phase -2: Maximum 3 weeks

Phase -3: Maximum 6 weeks

Phase- 4: Maximum 2 weeks

Distribution of Marks:-

Total Marks 100

Break up of marks (100)

Performance of Phase 1	:15
Performance of Phase 2	:20
Performance of Phase 3	:20
Performance of Phase 4	:45
Total	:**100**

Note: 1. Performance marks of Phase 1/2/3/4 will be given by Coordinators, Guide and external (if any) on completion of the respective phase.

2. Presentation and demonstration will be taken by Project Coordinator, Guide.

3. Guide feedback will be collected by Project Coordinator.

	POORNIMA UNIVERSITY, JAIPUR Faculty of Engineering and Technology								
	Name of Program: B.Tech. in Civil Engineering **Duration: 4 Years** **Total Credits: 174**								
	Teaching Scheme for Batch 2023-27								
	Semester-II								
Course Code	**Name of Course**	**Teaching Scheme**				**Marks Distribution**			**Credits**
		Lecture (L)	**Tutorial (T)**	**Practical (P)**	**SH**	**IE**	**ESE**	**Total**	
A.		**Major (Core Courses)**							
A.1	**Theory**								
BTXCCE2101	Python	3	-	-	2*	40	60	100	3
BTXCCV2102/ BTXCEE2103	Basic of Civil Engineering / Basics of Electrical and Electronics Engineering	3	-	-	1+1*	40	60	100	3
BTXCSA2104/ BTXCME2105	Engineering Mathematics / Basic of Mechanical Engineering	3	-	-	1+1*	40	60	100	3
A.2	**Practical**								
BTXCCE2201	Programming in Python Lab	-	-	2		60	40	100	1
BTXCCV2202/ BTXCEE2203	Computer Aided Design (CADD)/ Basics of Electrical and Electronics Engineering Lab	-	-	2		60	40	100	1
BTXCME1205/ BTXCME1206	Workshop Practice/Engineering Graphics	-	-	2		60	40	100	1
BTXCCE1207	Exploratory Project	-	-	2	2*	60	40	100	1
B.		Minor Stream Courses/ **Department Electives**							
B.1	**Theory (Any One)**								
BTXECE2111 BTXECE2112 BTXECE2113 BTXECE2114 BTXEME2116 BTXECE2115	• Introduction to AI&DS • Introduction to Cyber Security • Introduction to Cloud • Introduction to Game Tech. • Engineering Mechanics • Digital Electronics	3	-	-		40	60	100	3
B.2	**Practical**								
C		**Multidisciplinary Courses**							
BTXEBX2109	MOOC Course-I (Human Behaviour)	2	0	0					2
D		**Ability Enhancement Courses (AEC)**							
BULCHU2204	Language Lab	0	0	2		60	40	100	1
E		**Skill Enhancement Courses (SEC)**							
BULCSE2201	Skill Enhancement Generic Course-II	-	-	2		60	40	100	1
F		**Value Added Courses (VAC)**							
BUVCPH2102	Health Behaviour & Communication	2	-	-		40	60	100	2
G		**Summer Internship / Research Project / Dissertation**							
		-	-	-					
Total		16	-	12	2/2+6*				**22**
Total Teaching Hours		**30/36**							

SH: Supporting Hours

***Classes will be conducted fortnightly.**

Code: BTXCCE2101	Python Programming	3 Credits [LTP: 3-0-0]

COURSE OUTCOME:

Students will be able to:

- Understand the basic terminology used in computer programming to write, compile and debug programs in Python programming language.
- Use different data types to design programs involving decisions, loops, and functions for problem solving
- Apply various object oriented programming
- Handle the exceptions which are raised during the execution of Python scripts
- Implement files and classes in the Python programming environment

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Introduction to Python Programming**	07
2.	**Python Operators and Control Flow statements**	09
3.	**Data Structures, Python Functions and Packages**	09
4.	**Object Oriented Programming**	08
5.	**File I/O Handling and Exception Handling**	09

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Python Programming**
	• Introduction to Unit • What is Python, • Uses of Python Programming Language / Python Applications • Features of Python Programming Language • Python-2 and Python-3 differences • Python environment setup — Installation and working of IDE • Running Simple Python scripts to display 'welcome' message. • Python Data Types: Numbers, String, Tuples, Lists, Dictionary. Declaration and use of data types • Python building blocks — Identifiers, Keywords, Indention, Variables, Comments • Conclusion of unit
2.	**Python Operators and Control Flow statements**
	• Introduction to Unit • Basic Operators: Arithmetic, Comparison/ Relational, Assignment, Logical, Bitwise, Membership, Identity operators, Python Operator Precedence • Control Flow: • Conditional Statements (if, if ... else, nested if) • Looping in python (while loop, for loop, nested loops) • Conclusion of Unit
3.	**Data Structures, Python Functions and Packages**
	• Introduction to Unit • Lists, Tuple, Sets, Dictionaries • String and Slicing • Use of Python built • User defined functions and its types • Command-line Arguments • Using standard packages (e.g. math, scipy, Numpy, pandas etc.) • Conclusion of Unit

4.	**Object Oriented Programming**
	• Introduction of Unit • Creating Classes and Objects • Inheritance • Method Overloading and Overriding • Data Hiding • Types of Methods : Instance Methods , Static Methods , Class Methods • Accessing attributes , Built-In Class Attributes • Conclusion of Unit
5.	**File I/O Handling andException Handling**
	• Introduction of Unit • Types of File • File Objects, File Built-in Function, File Built-in Methods • File Built-in Attributes • Read/write operations Reading Text • Errors in Python : Compile-Time Errors ,Runtime Errors , Logical Errors • try….except…else, try-finally clause • Regular expressions • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL:

S. No	Text Books:	Author	Edition	Publication
1.	Core Python Programming	Chun, JWesley	2007	Pearson,
2.	Head First Python	Barry,Paul	2010	ORielly,
Reference Book				
1	Learning Python Lutz, Mark O Rielly, 2009			
Online Resources				
1	https://www.learnpython.org/			
2	https://realpython.com/start-here/			
3	https://www.programiz.com/python-programming			

D. CO-PO Mapping

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	-	-	2	-	-	-	-	-
CO2	2	3	3	1	-	-	2	-	-	-	-	-
CO3	3	2	2	3	-	-	2	-	-	-	-	-
CO4	2	1	1	2	-	-	2	-	-	-	-	-
CO5	3	1	2	1	-	-	2	-	-	-	-	-

E. CO-PSO Mapping

COs and PSO's	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

BTXCCV2102 BASICS OF CIVIL ENGINEERING 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

The student will be able to:

CO1 Understand the importance and use of Engineering Materials

CO2 Apply the knowledge of material and elements in Building Construction.

CO3 Understand the importance of irrigation and water supply.

CO4 Apply the basic knowledge of mathematics and material to learn surveying and roads.

CO5 Understand the importance of Indian Standard Codes.

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	**Civil Engineering Materials**	**8**
2.	**Introduction to Building Construction**	**8**
3.	**Irrigation and Water Supply**	**7**
4.	**Survey and Highway Engineering**	**8**
5.	**Introduction to Indian Standards Codes**	**7**

B. DETAILED SYLLABUS

Unit	Unit Details
6.	**Civil Engineering Materials**
	• Traditional Material Introduction (Stones, Bricks, Lime, Cement, Timber) – Characteristics and their uses only • Mortar – Introduction, their Types (Cement Mortar, Lime Mortar, Mud Mortar, Special Mortar) and use. • Concrete – Introduction their Types (Plain Concrete, Reinforced Cement Concrete, Prestressed Concrete, Fiber Reinforced Concrete).
7.	**Introduction to Building Construction**
	• Introduction to Elements of Building • Foundation, their importance and their types. • Dampness and its Prevention. (Cause, ill effects and its solution).
8.	**Irrigation and Water Supply**
	• Definition and classification of irrigation – Irrigation structures – dams, weirs, cross drainage works, canal drops. Quality of water-Treatment methods
9.	**Survey and Highway Engineering**
	• Introduction to Surveying. • Instruments of Surveying and their uses, Linear Measurements, Insight to modern tools of Surveying (Auto Level, Theodolite, GPS) function only. • Introduction to Highway Engineering, Classification of Roads, Components of Highway, Super Elevation, Types of Pavements.
10.	**Introduction to Indian Standards Codes**
	• Introduction to IS codes for Building Deign (IS456:2000, IS800-2007, IS875 All Parts, IS1893:2016, IS13920)

C. RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
6.	Basics of Civil Engineering	S.S. Bhavikatti	Latest	New Age International Publishers
7.	Basic Civil Engineering	B C Punmia, Ashok K Jain, Arun K Jain	Latest	Laxmi Publications
8.	Basic Civil Engineering	G K Hiraska	Latest	Dhanpat Rai Publication
9.	Basic Civil Engineering	Jhonson Victor D and Esther Malini	Latest	Allied Publishers Limited, Madras
10.	Basic Civil Engineering	Arunachalam N	Latest	Pratheeba Publishers, Coimbatore
Important Web Links				
3.	https://nptel.ac.in/courses/105106201			
4.	https://onlinecourses.nptel.ac.in/noc20_ce02/preview			

D. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	2	1	–	–	–	–	–	–	–	–
CO-2	2	3	1	2	–	–	–	–	–	–	–	–
CO-3	3	2	2	2	–	–	–	–	–	–	–	–
CO-4	3	3	1	2	–	–	–	–	–	–	–	–
CO-5	3	3	2	2	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	–	3
CO-2	2	–	3
CO-3	1	–	3
CO-4	1	–	3
CO-5	2	–	3

Code: BTXCSA2105 Engineering Mathematics 3 Credits [LTP: 3-0-0]

A. COURSE OUTCOME

The student would be able:

CO1 To analyze and prove relationships between matrices, rank of matrix and systems of equations, Inverses.

CO2To analyze the basic structure of differential equations, and order and degree of the first order and first degree and its simple applications

CO3 To calculate asymptotes of different curves. They will be able to know fundamentals of tracing the various types of cures and asymptotes play a main role in tracing.

CO4To utilize methods of integration to evaluate volumes and surface of objects and lengths of curves.

CO5To apply vector differentiation, and integration in the scalar and vector fields

B. OUTLINE OF THE COURSE

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

C. 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, • Homogenous and reducible to homogenous equation • Linear Equation and reducible to linear form, Exact Equation • Linear differential equations with constant coefficients • Conclusion of Unit
3.	**Applications of Differential Calculus**
	• Introduction of Unit • Asymptotes • Multiple points • Curve tracing for standard Curves (Cartesian Curves only) • Conclusion & Real life applications
4.	**Integral Calculus**
	• Introduction of Unit • Gamma functions and their properties, beta function (only definition) • Double integrals, Double integral by changing into polar form, Areas by Double Integration • Change of order of integration • Conclusion of Unit
5.	**Vector Calculus**
	• Introduction of Unit • Scalar and Vector field • Differentiation and Integration of Vector functions • Gradient, Divergence and Curl, Directional derivatives • Conclusion of Unit

D. 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			

E. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	2	3	1	1	–	–	–	–	–	–	–	–
CO-2	3	2	1	2	–	–	–	–	–	–	–	–
CO-3	2	3	2	1	–	–	–	–	–	–	–	–
CO-4	2	2	2	1	–	–	–	–	–	–	–	–
CO-5	2	3	1	1	–	–	–	–	–	–	–	–

F. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	2	–	–
CO-2	2	–	–
CO-3	1	–	–
CO-4	2	–	–
CO-5	2	–	–

Code: BTXCCE2201	PYTHON PROGRAMMING LAB	1 Credit [LTP: 0-0-2]

COURSE OUTCOMES

The student will be able to:

CO1 Understand why Python is a useful scripting language for developers.

CO2 Identify the key issues in Python code, develop and experiment with python programming.

CO3 Develop problem solving and critical thinking skills in fundamental enable techniques like conditionals and loops.

CO4 Construct and explain with structure and concept of different data type like, List and Dictionary.

CO5 Implement read and write data from/to files in Python Develop Python programs step-wise by defining functions with tinker.

A. List of Programs:

Part A

1. Write and run a Python program that outputs the value of each of the following expressions:

5.0/9.0
5.0/9
5/9.0
5/9
9.0/5.0
9.0/5
9/5.0
9/5

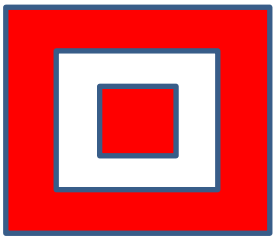
Based on your results, what is the rule for arithmetic operators when integers and floating point numbers are used?

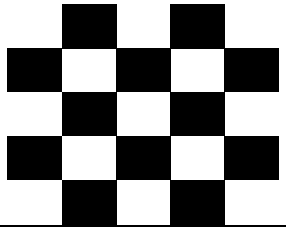
2. Write and run a Python program that asks the user for a temperature in Celsius and converts and outputs the temperature in Fahrenheit. (Use the formula given in the example above and solve for tempFin terms of tempC.)
3. Here is an algorithm to print out n! (n factorial) from 0! to 19!:
   1. Set f = 1
   2. Set n = 0
   3. Repeat the following 20 times:
   a. Output n, "! = ", f
   b. Add 1 to n
   c. Multiply f by n

   Using a for loop, write and run a Python program for this algorithm.
4. Modify the program above using a `while` loop so it prints out all of the factorial values that are less than 1 billion.
5. Modify the first program so it finds the minimum in the array instead of the maximum.
6. (Harder) Modify the first program so that it finds the **index** of the maximum in the array rather than the maximum itself.

Part B

7. Modify the bubble sort program so it implements the improvements discussed in class. (HINT: To exit the main loop if the array is already sorted, simply change the loop variable to equal the last value so the loop ends early.)
8. Draw the Target symbol (a set of concentric Squares, alternating red and white) in a graphics window that is 200 pixels wide by 200 pixels high. Hint: Draw the largest circle first in red, then draw the next smaller circle in white, then draw the next smaller circle in red. Graphical objects drawn later appear "on top of" graphical objects drawn earlier.

9. Try entering the following  literal values at the prompt. (Hit ENTER after each)
   -5
   -4.2
   4.5
   4.14
   0.90
   Something odd should occur. *Describe it on paper.*
10. Create a 5 X 5 rectangle whose top left corner is at (*row**5, *col**5). (Where is the bottom right corner?) If the sum of the *row* and *col* numbers is even, set the fill color of the rectangle to white, otherwise set it to black. Then draw the rectangle.



B. **RECOMMENDED STUDY MATERIAL:**

S. No	Text Books:	Author	Edition	Publication
1.	Core Python Programming	Chun, JWesley	2007	Pearson,
2.	Head First Python	Barry,Paul	2010	Orielly,
Reference Book				
1	Learning Python Lutz, Mark O Rielly, 2009			
Online Resources				
1	https://www.learnpython.org/			
2	https://realpython.com/start-here/			
3	https://www.programiz.com/python-programming			

C. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	**3**	**2**	**1**	**2**	-	-	**2**	–	–	–	–	–
CO-2	**2**	**3**	**3**	**1**	-	-	**2**	–	–	–	–	–
CO-3	**3**	**2**	**2**	**3**	-	-	**2**	–	–	–	–	–
CO-4	**2**	**1**	**1**	**2**	-	-	**2**	–	–	–	–	–
CO-5	**3**	**1**	**2**	**1**	-	-	**2**	–	–	–	–	–

D. CO-PSO Mapping

CO-PSO	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

BTXCCV2202	Computer Aided Design Lab	Credit [LTP: 0-0-2]

COURSE OUTCOMES:-

Students will be able to:

CO1 Apply basic concepts to develop construction (drawing) techniques.

CO2 Analyze drawings through editing and plotting techniques

CO3 Apply basic tools to develop outlines in drawings.

CO4 Apply tools to control and manage the drawings in AutoCAD for different purposes

CO5 Create the layout of plans in workspace.

A. **LIST OF EXPERIMENTS**

1	• **Introduction to AutoCAD and Drawing Tools**
2	• Draw Different Shapes using Line, Polyline Circle, and Polygon.
3	• Draw Different Shapes using Rectangle
4	• Use of Dimensions in Circle, rectangles, Line and other shapes.
5	• Modify Drawings in AutoCAD using Modification Tools.
6	• Offset and Mirror Different Shapes and Lines.
7	• .Use Trim, Extend &Align, Scale and Strech Command.
8	• Use of Text, Line, Block and Conversion Tools.
9	• Introduction to layers, how to add, modify layers in layer manager.
10	• Introduction of hatch command in autocad
11	• Opening and modifying properties in autocad.
12	• Layout design of building
13	• 2d Plan Of Residential Structure

B. **CO-PO Mapping**

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	2	1	—	—	—	—				
CO-2	2	3	1	2	—	—	—	—				
CO-3	3	2	2	2	—	—	—	—				
CO-4	3	3	1	2	—	—	—	—				
CO-5	3	3	2	2	—	—	—	—				

C. **CO-PSO Mapping**

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	–	3
CO-2	2	–	3
CO-3	1	–	3
CO-4	1	–	3
CO-5	2	–	3

Code: BTXCME1205	WORKSHOP PRACTICE	1 Credit [LTP: 0-1-2]

COURSE OUTCOMES:-

Students will be able to:

CO1 Create a model of T Lap and T- Briddle Joint through carpentry shop
CO2 Analyze the making of prototype model through foundry shop
CO3 Analyze the difference between gas welding and arc welding and their applications
CO4 Create a model on fitting shop through filling, drilling and tapping operation
CO5 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** 13. T – Lap joint 14. Bridle joint
2.	**Foundry Shop** 15. Mould of any pattern
3.	**Welding Shop** 16. Square butt joint by MMA welding 17. Lap joint by MMA welding
4.	**Machine Shop Practice** 18. Job on lathe with facing operation 19. Job on lathe with one step turning and chamfering operations 20. Job on shaper for finishing two sides of a job
5.	**Fitting Shop** 21. Finishing of two sides of a square piece by filing 22. Drilling operation on fitted job (two holes) 23. Slotting operation on fitted job 24. Tapping operation on fitted job

B. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	2	1	–	–	–	–	–	–	–	–
CO-2	2	3	1	2	–	–	–	–	–	–	–	–
CO-3	3	2	2	2	–	–	–	–	–	–	–	–
CO-4	3	3	1	2	–	–	–	–	–	–	–	–
CO-5	3	3	2	2	–	–	–	–	–	–	–	–

C. CO-PSOs Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	–	3
CO-2	2	–	3
CO-3	1	–	3
CO-4	1	–	3
CO-5	2	–	3

Code: BTXCME1106	Engineering Graphics	1 Credit [LTP: 1-0-2]

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

CO5 analyze the development of surface and analyze the sheet metal requirement for fabricating a surface.

A. List of Experiments

1.	• Lines, Lettering and Dimension (Sketch Book) • Scales: Representative Fraction, plain scales, diagonal scales, (In drawing sheet 1)
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 2)
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 3)
4.	• Orthographic Projections (3 Problems in drawing sheet 4)
5.	Sectional Views (2 Problems) and Riveted joints, lap joints, butt joints, chain riveting (drawing sheet 5)

B. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	2	1	—	—	—	—	—	—	—	—
CO-2	2	3	1	2	—	—	—	—	—	—	—	—
CO-3	3	2	2	2	—	—	—	—	—	—	—	—
CO-4	3	3	1	2	—	—	—	—	—	—	—	—
CO-5	3	3	2	2	—	—	—	—	—	—	—	—

C. CO-PSO Mapping

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	—	3
CO-2	2	—	3
CO-3	1	—	3
CO-4	1	—	3
CO-5	2	—	3

Code: BTXCEE1207	Exploratory Project	1 Credits [LTP: 0-0-1]

LAB 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

GUIDELINES:

9. The Project group must complete project in all respect (assembly, testing, fabrication, tabulation, test result etc.)
10. 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.
11. The guides should regularly monitor the progress of the project work.
12. The project work along with project report should be submitted as part of term work in first term on or before the last day of the second term.
13. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
14. Assessment of the project forward of marks shall be done by the guide and a departmental committee.
15. The guide should be internal examiner for oral examination.
16. 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.

Phases:

Project work is divided into the following phases:

Phase I

- Allocation of groups(Max. 4 Members & Min. 2 Members) & guide
- Black board presentation on topics as per the choice & feasibility
- Submission of abstract & synopsis of the project

Phase II

- Procurement of the components
- 2D/3D figure or model
- Paper work like any circuit diagram and tentative cost

Phase III

- Working Model of the project
- Mounting the components
- Final hardware evaluation/presentation
- Submission of the final hardware to the coordinator.

Phase V

- Final report submission (after project exhibition)
- Paper presentation on the selected project in seminars /conferences/journals
- Viva voce

Deadlines of Phases:

The Project will be covered in 13 weeks from starting of semester. The time allocated to each phase is as follow:

Phase -1: Maximum 2 weeks

Phase -2: Maximum 3 weeks

Phase -3: Maximum 6 weeks

Phase- 4: Maximum 2 weeks

Distribution of Marks:-

Total Marks 100

Break up of marks (100)

Performance of Phase 1	:15
Performance of Phase 2	:20
Performance of Phase 3	:20
Performance of Phase 4	:45
Total	:**100**

Note: 1. Performance marks of Phase 1/2/3/4 will be given by Coordinators, Guide and external (if any) on completion of the respective phase.

2. Presentation and demonstration will be taken by Project Coordinator, Guide.

3. Guide feedback will be collected by Project Coordinator.

Code: BTXECE2111 Introduction to Artificial Intelligence 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Analyze various agents in AI
- Apply Search techniques to solve problem
- Solve the Constraint Satisfaction Problems using AI methods
- Implement Adversarial Search in Game Playing
- Solve real world problems using AI techniques

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Artificial Intelligence**	07
2.	**Problem solving by Search**	08
3.	**Constraint Satisfaction Problems**	07
4.	**Software Agents**	07
5.	**AI applications**	07

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Artificial Intelligence**
	• Introduction to Artificial Intelligence • Definition of Artificial Intelligence • A brief history of Artificial Intelligence • Why do we study AI? • What is AI? • Views of AI: Acting Humanly, Thinking Humanly, Thinking Rationally and Acting Rationally • Areas of AI • Agents and environments • PEAS (Performance measure, Environment, Actuators, Sensors) • Environment types • Agent types: Simple reflex agents, Model-based reflex agents, Goal-based agents and Utility-based agents • Examples of Agent • Conclusion of the Unit
2.	**Problem solving by Search**
	• Introduction of Unit • Problem-solving agents • Problem formulation • Example problems: 8-Puzzle problem and 8-queens problem • Basic search algorithms • Un-informed search strategies: Breadth-first search, Depth-first search, Depth-limited search, Uniform-cost search and Iterative deepening search • Informed Search Algorithms: Best-first search, Greedy best-first search, A* search, Hill-climbing search, and Genetic algorithms • Conclusion of the Unit

3.	**Constraint Satisfaction Problems**
	• Introduction to Constraint Satisfaction Problems (CSP) • Why do we need to consider CSPs? • Constraint Propagation • CSP Vs Search problems • Real-world CSPs • Finite vs. Infinite CSP • CSP as a Search Problem : Backtracking search for CSPs, Forward checking for CSPs and Local search for CSPs • Conclusion of the Unit
4.	**Adversarial Search and Game Playing**
	• Introduction to Adversarial Search and Game Playing • Games: Definition, Search vs. Games and Game Tree • Optimal decisions in Games: Mini max algorithm and α-β pruning with example • Imperfect, real-time decisions • Partially Observable Games • State-of-the-Art Game Programs: Chess on Deep Blue, Chess on standard PCs, Checkers on Chinook and Backgammon: TD-Gammon • Conclusion of the Unit
5.	**AI Applications**
	• Introduction of Unit • Language Models • Information Retrieval, Extraction • Natural Language Processing • Machine Translation • Speech Recognition • Expert system: Introduction, phases, architecture, Expert system Vs Traditional system • Robot, Hardware , Planning, Moving • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Artificial Intelligence: A Modern Approach	S. Russell and P. Norvig	Third Edition	Prentice Hall
2.	Prolog: Programming for Artificial Intelligence	I. Bratko	Fourth edition	Addison-Wesley Educational Publishers Inc

Reference Book	
1.	Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, M. Tim Jones.
2.	The Quest for Artificial Intelligence, Cambridge University Press, Nils J. Nilsson.
3.	Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, William F. Clocksin and Christopher S. Mellish.
4.	Multi Agent Systems, Second Edition, MIT Press, Gerhard Weiss.
5.	Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, David L. Poole and Alan K. Mackworth.

Online Resources	
1.	https://onlinecourses.nptel.ac.in/noc21_ge20/preview
2.	https://www.coursera.org/learn/introduction-to-ai
3.	https://www.javatpoint.com/artificial-intelligence-tutorial

D. CO-PO Mapping

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	1	2	2	-		—	—	—	—	—
CO-2	2	3	3	1	-	-	2	—	—	—	—	—
CO-3	3	2	2	3	2	-		—	—	—	—	—
CO-4	2	1	1	2	-	-	2	—	—	—	—	—
CO-5	3	1	2	1	-	-	2	—	—	—	—	—

E. CO-PSO Mapping

	PSO1	**PSO2**	**PSO3**
CO1	3	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

Code: BTXECE2112 INTRODUCTION TO CYBER SECURITY 3 Credit [LTP: 3-0-0]

COURSE OUTCOME

Students will be able to:

- Know basic concepts and importance of information security and cryptography.
- Recognize the business need for information security.
- Gain knowledge about advance cryptographic algorithms and Identify security issues and objectives in computer systems and networks.
- Learn about cryptographic key management.
- Know how message digests are used in authentication.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	**Introduction to Information Security**	8
2	**The Need for IT Security – I**	8
3	**Advance Algorithms and Techniques**	8
4	**Key Management**	8
5	**Cryptography in User Authentication**	7

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, Polyalphabetic substitution) ● Conclusion of the Unit
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) ● Conclusion of the Unit 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	Atul Kahate	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

Reference Book	
1.	Security in Computing, Fourth Edition, by Charles P. P fleeger, Pearson Education
2.	Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson
3	Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
Online Resources	
1.	https://www.sans.org/cyber-security-courses/introduction-cyber-security/
2.	https://nptel.ac.in/courses/106106129

D. CO-PO MAPPING

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	1	2	2	-		—	—	—	—	—
CO-2	2	3	3	1	-	-	2	—	—	—	—	—
CO-3	3	2	2	3	2	-		—	—	—	—	—
CO-4	2	1	1	2	-	-	2	—	—	—	—	—
CO-5	3	1	2	1	-	-	2	—	—	—	—	—

E. CO-PSO MAPPING

CO-PSO	PSO1	PSO2	PSO3
CO1	3	-	-
CO2	2	-	-
CO3	3	-	-
CO4	2	-	-
CO5	1	-	-

Code: BTXECE2113 INTRODUCTION TO CLOUD COMPUTING 3 Credits [LTP: 3-0-0]

COURSE OUTCOME:
Students will be able to:

- Explain the core concepts of the cloud computing paradigm
- Learn the underlying principles of Cloud Technology and various types of cloud
- Computing architecture and types.
- Learn to evaluate between different cloud solutions offered by various providers based on their merits and demerits.
- Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost.
- Analyze various cloud programming models and apply them to solve problems on the cloud.

A. OUTLINF OF THE COURSE

Unit	Title of the unit	Time required for the Unit (Hours)
1	**Introduction**	7
2	**Cloud Computing Companies and Migrating to Cloud**	8
3	**Cloud Cost Management and Selection of Cloud Provider**	8
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. ● Considerations for selecting cloud solution. Understanding Best Practices used in selection of Cloud service 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

D. CO-PO MAPPING

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	1	2	2	-		—	—	—	—	—
CO-2	2	3	3	1	-	-	2	—	—	—	—	—
CO-3	3	2	2	3	2	-		—	—	—	—	—
CO-4	2	1	1	2	-	-	2	—	—	—	—	—
CO-5	3	1	2	1	-	-	2	—	—	—	—	—

E. CO-PSO MAPPING

	PSO1	**PSO2**	**PSO3**
CO1	3	-	-
CO2	1	-	-
CO3	3	-	-
CO4	2	-	-
CO5	2	-	-

Code: BTXECE2114	Introduction to Game Technology	3 Credits [LTP: 3-0-0]

COURSE OUTCOME

Student will able to

- Comprehend the critical importance of Game Technology
- Use learned skills to solve problems of various layouts
- Recognize what is the role each hardware component of a PC plays in games and in making games
- Conduct independent work in entertainment software engineering context.
- Work as a productive member and as part of a team developing larger entertainment software product.

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	**Introduction to Gaming Technology**	07
2.	**History of Gaming Hardware**	08
3.	**Input devices**	08
4.	**Functions of a GPU in games**	07
5.	**Role of a CPU in games**	07

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Introduction to Gaming Technology**
	• Introduction of Unit • Basics of processes and models applied in the entertainment software industry • Basics of the game development tools • Introduction to game engines and their functions • Basics of 3D objects • Introduction to game development-related programming problem. • Basics of artificial intelligence in entertainment software engineering context. • Basics of sound engineering • Gamification and Serious games • Basic principles of AR and VR development • Conclusion of unit
2.	**History of Gaming Hardware**
	• Introduction of Unit • Console architecture over the decades • Evolution of input devices in games along with their design changes • analysis of hardware generations of consoles - with a brief overview of Gen 1-4 devices a • A broader look at some significant consoles of Gen 5-8 • Conclusion of Unit
3.	**Input devices**
	• Introduction of Unit • Types and variations of input devices (touch devices, controllers, keyboards, and mice) • How these devices work • Taking multiple types of inputs from these devices • Working on input • Adding support for these devices in your games – • challenges of building/designing an input device (ergonomics, abstraction vs immersion) • Conclusion of Unit

4.	**Functions of a GPU in games**
	• Introduction of Unit • Introduction to graphics APIs • commonly used APIs • Working of APIs in GPU Programming) • Shaders • Lighting Techniques (Ray tracing, ray-casting) • Difference between an API and an SDK • Conclusion of Unit
5.	**Role of a CPU in games**
	• Introduction of Unit • multi-threading • hyper-threading, • multi-core CPUs • parallel processing – • Need of multi-threading in games • Function of CPU in games • collision detection • pathfinding, • Realtime object tracking • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Advanced Game Development with Programmable Graphics Hardware	Alan Watt, Fabio Policarpo	April 2005	A K Peters Ltd
2.	Unity 5 Game Optimization	Chris Dickinson	Nov 2015	O' Riley Media
Reference Book				
3.	Evan Amos, 'The Game Console: A Photographic History from Atari to Xbox', No Starch Press, November 2018, ISBN 978-1593277437			
Online Resources				
4.	https://www.edx.org/learn/game-development tps://learnui.design/			
5.	https://files.eric.ed.gov/fulltext/EJ1090277.pdf			

D. CO-PO MAPPING

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	1	2	2	-		—	—	—	—	—
CO-2	2	3	3	1	-	-	2	—	—	—	—	—
CO-3	3	2	2	3	2	-		—	—	—	—	—
CO-4	2	1	1	2	-	-	2	—	—	—	—	—
CO-5	3	1	2	1	-	-	2	—	—	—	—	—

E. CO-PSO MAPPING

CO-PSO	**PSO1**	**PSO2**	**PSO3**
CO1	2	-	-
CO2	2	-	-
CO3	3	-	-
CO4	3	-	-
CO5	1	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXECE2115 Digital Electronics 3 Credits [LTP: 3-0-0]

Course Outcomes: -

Students will be able to:

CO1. Verify and interpret truth tables for all logic gates.

CO2. Design of decoders and multiplexer.
CO3. Use various flip-flops in digital circuits
CO4. Apply registers and counters in digital circuits.
CO5. Do conversion from A/D and D/A convertors.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Number System and Logic Gates	7
2.	Decoders, Multiplexers & De-Multiplexers	6
3.	Flip-Flops	7
4.	Registers And Counters	8
5.	Memories And Converters	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	**Number System and Logic Gates**
	• **Introduction to number systems** – Binary to decimal conversion – Decimal to binary conversion –Octal numbers – Hexadecimal numbers • **Logic gates** – NOT, OR, AND – Universal NAND and NOR gates – EX-OR and EX-NOR gates – DeMorgan's Theorems — 1's complement – 2's complement – Adders (half & full) – Subtractor (half & full). • Conclusion of the Unit
2.	**Decoders, Multiplexers & De-Multiplexers**
	• Introduction of Unit • Basic functions and block diagram of Encoders and decoders. • Basic functions and block diagram of Multiplexers and De-Multiplexers, Different types and ICs. • 4 bit decoder circuits for 7 segment display and other applications. • Conclusion of the Unit.
3.	**Flip-Flops**

	• Introduction of Unit
	  • J-K Flip-Flop
	  • R-S Flip-Flop
	  • D-Type Flip-Flop
	  • T-Type Flip-Flop
	  • Applications of Flip-Flops
	• Conclusion of the Unit

4.	**Registers And Counters**
	• Introduction to Shift Register • Introduction and basic concepts including shift left and shift right. • Serial in parallel out, serial in serial out, parallel in serial out, parallel in parallel out. • Introduction to Counters (Asynchronous and Synchronous counters) • Binary up/down counters (upto MOD-8) • Ring counter with timing diagram • Conclusion of the Unit

5.	**Memories And Converters**
	• Introduction of Unit • ***Memories*** – ROM, RAM, EPROM, EEPROM – Volatile and non-volatile – Static and dynamic RAM. • **Analog to digital converters** – Parallel Comparator A/D converter – Dual slope converter –Successive approximation method – Counter type converter. • **Digital to analog converters** – Binary weighted D/A converter – R/2R ladder network converter • Conclusion of the Unit

C. RECOMMENDED STUDY MATERIAL

S. No	Text Books:	Author	Edition	Publication
1.	Digital Principles and Applications	Donald P Leach, Malvino	-	McGraw Hill
2.	Modern Digital Electronics	RP Jain	-	Tata McGraw Hill
3.	Digital Fundamentals	Floyd and Jain	-	Pearsons Education
Reference Book				
3.	Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi			
4.	Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill Education Pvt Ltd, New Delhi			
Online Resources				
3.	https://archive.nptel.ac.in/courses/108/105/108105132/			
4.	https://onlinecourses.nptel.ac.in/noc22_ee55/preview			

D. MAPPING OF CO VS PO

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	1	2	2	-		—	—	—	—	—
CO-2	2	3	3	1	-	-	2	—	—	—	—	—
CO-3	3	2	2	3	2	-		—	—	—	—	—
CO-4	2	1	1	2	-	-	2	—	—	—	—	—
CO-5	3	1	2	1	-	-	2	—	—	—	—	—

E. CO-PSO MAPPING

CO-PSO	PSO1	PSO2	PSO3
CO1	2	-	-
CO2	2	-	-
CO3	3	-	-
CO4	3	-	-
CO5	1	-	-

Note: On the basis of mapping of COs with POs, this course is related to Employability/Skill Development

Code: BTXEME2116 ENGINEERING MECHANICS 3 Credits [LTP: 3-0-0]

COURSE OUTCOME

The student will be able to:

CO1 Analyze the forces act on a component and method of resolution.
CO2 Evaluate 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**	**8**
2.	**Machine & Moment of Inertia**	**8**
3.	**Friction & Belt Drive**	**7**
4.	**Dynamics of Particles**	**8**
5.	**Work, Power & Impact**	**8**

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 – System of Pulleys. • 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- I, L, C and H. • Conclusion of Unit
3.	**Friction & Belt Drive**
	• Introduction of Unit • Friction: Types of Friction, Laws of friction, Angle of friction, Angle of repose, Numericals on 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			

D. CO-PO MAPPING

COs and POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	2	2	1	–	–		—	—	—	—	—
CO-2	2	3	1	2	–	–	2	—	—	—	—	—
CO-3	3	2	2	2	–	–		—	—	—	—	—
CO-4	3	3	1	2	–	–	2	—	—	—	—	—
CO-5	3	3	2	2	–	–	2	—	—	—	—	—

E. CO-PSO MAPPING

COs and PSOs	PSO-1	PSO-2	PSO-3
CO-1	1	—	3
CO-2	2	—	3
CO-3	1	—	3
CO-4	1	—	3

Code: BERCSA3101	ADVANCE MATHEMATICS	3 Credits [LTP: 3-0-0]

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

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

CO2 Fourier Transformer apply in the Industrial based studies and their properties

CO3 Industrial application base studies for Z Transformer and their properties

CO4 Create the complex function and their properties

CO5 Evaluate solution of singular series by Taylor's and Laurent's series. Application based studies for Complex integration and residue in real life. Studies for proper uses and applications of measures of central tendency and dispersion

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 residues • Simple contour integration • Conclusion and Summary of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	ReferenceBook	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/				

D. CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	–	–	–	–	–	–	–	–
CO2	2	3	1	1	–	–	–	–	–	–	–	–
CO3	3	3	2	1	–	–	–	–	–	–	–	–
CO4	3	3	2	1	–	–	–	–	–	–	–	–
CO5	3	2	1	1	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

CO1	PSO1 2	PSO2 –	PO3 2
CO2	2	1	1
CO3	2	2	2
CO4	2	–	3
CO5	2	–	–

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

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

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

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

CO3 Analyze the synchronous machine principle of Operation, emf equation, rotating Magnetic field Starting Methods.

CO4 Appraise the induction motor constriction, working principle, Torque-slip characteristics and speed control method.

C05 Rewrite the operation of Capacitor start capacitor run, motors, Shaded pole motor, Repulsion type motor, Universal motor , Hysteresis motor , Permanent magnet synchronous motor, Switched reluctance motor and Brushless D.C motor

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 STUDY MATERIAL:

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	Laxmipublications
4.	Electrical Technology	Theraja, B.L. andTheraja,	Vol.II, nd	S.Chand
5.	ElectricMachines	Nagrath,I.J	Latest	Tata McGrawhill

Websites

khanacademy.com

https://nptel.ac.in/courses/108/102/108102146/

D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	–	–	–	–	–	–	–	–
CO2	3	3	1	1	–	–	–	–	–	–	–	–
CO3	2	2	1	1	–	–	–	–	–	–	–	–
CO4	2	2	2	1	–	–	–	–	–	–	–	–
CO5	2	2	2	1	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	–	2	2
CO2	–	3	2
CO3	–	1	2
CO4	–	–	3
CO5	–	–	2

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

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

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 Analyze 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 Apply 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
1.	Philosophy of measurement & Analog measurement of Electrical Quantities	8
2.	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 • Electro dynamics, Thermo couple, Electro static & Rectifier type • Ammeters & voltmeters. Electrodynamics Wattmeter. • Three phase wattmeter, Power in three phase system. • Errors in Measurement System & remedies in wattmeter and Energy meter. • Conclusion of Unit
2.	**Instrument Transformers**

	• Introduction of Unit • 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.

C. RECOMMENDED STUDY MATERIAL:

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
5.	Electrical & Electronic Measurement &Inst.	A.K.Sawhney	Latest	Dhanpat Rai &Sons

6.	Electrical Measurement & Measuring Instrument	Golding & F.C.Widdis,	Latest	A.W. Wheeler & Co. Pvt. Ltd

Websites

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

D. CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	–	–	–	–	–	–	–	–
CO2	3	2	1	1	–	–	–	–	–	–	–	–
CO3	3	3	2	1	–	–	–	–	–	–	–	–
CO4	3	3	1	1	–	–	–	–	–	–	–	–
CO5	3	2	1	1	-	-	-	-	-	-	-	-

E. CO-PSO Mapping:

	PSO1	PSO2	PO3
CO1	–	2	3
CO2	–	2	3
CO3	–	2	3
CO4	–	2	3
CO5	–	2	3

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

COURSEO UTCO MES: After Successful completion of the course students will be able to-

CO1 - Understand theory and applications of Electronics Devices.

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

CO3- Applications of Feedback and oscillator Circuits electrical and electronics engineering.

CO4- Apply Number System and Boolean algebra in selectivity and applications in engineering and technology.

CO5- Analysis & design of Combinational Logic.

A. OUTLINE OF THECO URSE

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 Unit • 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.Multistageamplifiers,frequencyresponseofbasic&compoundconfiguration,Poweramplifiers:Class A, B, AB, C and D stages, IC outputstages. • OperationalAmplifiers:Op-AmpBas ics,practicalOp-

	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 Unit
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 logicgates • 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/c ourses/108102112https://nptel.ac.in/courses/108105158 • https://nptel.ac.in/courses/117103064				

D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	–	–	–	–	–	–	–	–
CO2	3	2	1	2	–	–	–	–	–	–	–	–
CO3	3	2	2	1	–	–	–	–	–	–	–	–
CO4	2	2	1	1	–	–	–	–	–	–	–	–
CO5	3	3	2	1	–	–	–	–	–	–	–	–

E. CO- PSO Ma pping

	PSO1	PSO2	PO3
CO1	–	–	2
CO2	–	–	2
CO3	–	–	2
CO4	–	–	3
CO5	–	–	3

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

COURSEO UTCO MES: After Successful completion of the course students will be able to understand-

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 Analyze the role of
CO4 algorithms in computing with example.

CO5 Analyze the Elementary Graph Algorithms with example.

A. OUTLINE OF THECO URSE

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 ofUnit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	ReferenceBook	Author	Edition	Publication
1	Havowitz &Sawhni	Data structures in 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/

D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	–	–	–	–	–	–	–	–
CO2	3	2	1	2	–	–	–	–	–	–	–	–
CO3	3	2	2	1	–	–	–	–	–	–	–	–
CO4	2	2	2	1	–	–	–	–	–	–	–	–
CO5	2	3	2	1	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	–	–	2
CO2	–	–	2
CO3	–	–	2
CO4	–	–	3
CO5	–	–	3

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

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

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

CO2 - To understand role significance of solar energy.

CO3 - To provide importance of Wind Energy.

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

CO5 - To get the utilization of 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.	**GEO THER MALENERGY& ENER GYCONS ERVA TION**
	• 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	EarthscanLtd
2	Solar Water and Pool Heating Manual	NA	NA	FloridaSolar
3	Planning and Installing Solar Thermal Systems: A Guide for Installers, Architects and Engineers	NA	NA	KindleeBook

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/

D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	–	–	–	–	–	–	–	–
CO2	3	3	1	1	–	–	–	–	–	–	–	–
CO3	3	3	2	1	–	–	–	–	–	–	–	–
CO4	3	2	2	2	–	–	–	–	–	–	–	–
CO5	2	2	1	2	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	2	–	–
CO2	1	–	–
CO3	2	–	–
CO4	1	–	–

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

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

LO1	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.
LO2	Investigate the efficiency of D.C. Shunt motor by loss summation (Swinburne's) method and by Hopkinson's test.
LO3	Evaluate the O.C. and S.C. test, back to back test and parallel operation of single phase transformer.
LO4	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.	Toperformparalleloperationoftwo(a)1-phasetransformers(b)3-phasetransformersanddeterminetheirloadsharing
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 current.
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.

LO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
LO1	2	1	–	–	–	2	2	–	–	–	–	–
LO2	1	2	–	–	–	2	3	–	–	–	–	–
LO3	1	1	–	–	–	1	3	–	–	–	–	–
LO4	2	2	–	–	–	2	2	–	–	–	–	–
LO5	1	1	–	–	–	2	2	–	–	–	–	–

LO-PSO Mapping:

	PSO1	PSO2	PO3
LO1	2	–	–
LO2	2	–	–
LO3	1	–	–
LO4	2	–	–
LO5	2	–	–

Code: BERCCE3202	DATA STRUCTURE LAB	1 Credit [LTP: 0-0-2]

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

LO1	Illustrate the types of boiler, boiler draught and its applications.
LO2	Analyze the dryness fraction using throttling calorimeter.
LO3	Examine the steam condensers and cooling towers and applications.
LO4	Analyze the Isothermal and Volumetric efficiency of reciprocating air compressor.
LO5	Perform the analysis of refrigerator and air-conditioning system performance.

LIST OFEXPERI MENTS:

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/

LO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
LO1	3	3	1	1	–	–	–	–	–	–	–	–
LO2	3	2	2	1	–	–	–	–	–	–	–	–
LO3	2	2	1	1	–	–	–	–	–	–	–	–
LO4	2	2	1	1	–	–	–	–	–	–	–	–
LO5	3	2	1	1	–	–	–	–	–	–	–	–

LO-PSO Mapping

	PSO1	PSO2	PO3
LO1	–	–	3

LO2	–	–	2
LO3	–	–	3
LO4	–	–	2.75
LO5	–	–	2

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

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

LO1 Evaluate ac voltmeter, ac ammeter and error r.m.s. value is measured by a multimeter and displacement with help of LVDT.

LO2 Evaluate the power and power factor and Measure Low resistance by Kelvin's double bridge, measurement of voltage, current and resistance using dc potentiometer

LO3 Evaluate various parameters like inductance, frequency and capacitance by Anderson's bridge and maxwell's bridge, CRO, Wein's bridge.

LO4 Evaluate various parameters like inductance, frequency and capacitance by Anderson's bridge and maxwell's bridge, CRO, Wein's bridge.

LO5 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 LVDT...
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 bridge.
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 cell.
12	Study of the following transducer(1) PT-100 (2) RTD (3) Thermistor and thermocouple

Virtual Lab-http://202.3.77.143/virtuallab/

LO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
LO1	2	3	1	1	–	–	–	–	–	–	–	–
LO2	2	3	1	1	–	–	–	–	–	–	–	–
LO3	2	3	2	1	–	–	–	–	–	–	–	–
LO4	2	3	1	1	–	–	–	–	–	–	–	–
LO5	2	2	2	1	–	–	–	–	–	–	–	–

LO-PSO Mapping

	PSO1	PSO2	PO3
LO1	1	–	2
LO2	1	–	2
LO3	2	–	3
LO4	1	–	1
LO5	1	–	2

Code: BERCEE3204 TECHNICAL SEMINAR 2 Credits [LTP: 0-0-2]

1. For seminar 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 at the end of term.
2. Selection of topic should be done by students in consultation with concerned guide

a). Topic should be related to branch but it should be extended part of the branch (latest and advance topic).

b). 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. iv. Future scope. v. Conclusion.

CODE: BERC EE3205- INTRODUCTION TO MATLAB

2 Cre dit [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 assignedproblem

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

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

CO1 Prepare the students to have a basic knowledge in the analysis of graph theory.

CO2 Analyze the 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 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

CO5 Analyze the frequency response of circuits and to obtain the correlation between time domain and frequency domain response specifications

A. OUTLINE OF THECO URSE

Unit No.	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.	CircuitsandNetworksAnalysisa ndSynthesis	Sudhakar A.Shyammohan	1st	TataMcGraw-Hill
5.	CircuitsTheory	A.Chakrawarty	2nd	Dhanpat Rai &Co.
Webs ites				

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

D. CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	1	–	–	–	–	–	–	–	–
CO2	2	2	1	1	–	–	–	–	–	–	–	–
CO3	3	2	2	1	–	–	–	–	–	–	–	–
CO4	3	2	2	1	–	–	–	–	–	–	–	–
CO5	3	2	2	1	–	–	–	–	–	–	–	–

E. CO-PSO Mapping:

	PSO1	PSO2	PO3
CO1	2	–	–
CO2	–	1	2
CO3	2	3	1
CO4	1	2	–
CO5	2	–	–

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

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 Synthesizethecontrolsystemcomponentsanddiscusstheconceptofstabilityandnecessary conditions

CO4 Performfrequencydomainanalysisoflinearcontrolsystemusingvariousfrequencyresponse 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 of Unit • 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, 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 https://nptel.ac .in/c ourses/108/106/108106098/

D. CO-PO Mapping

	PO 1	PO2	PO 3	PO4	PO 5	PO6	PO 7	PO8	PO 9	PO10	PO11	PO12
CO1	3	2	1	1	–	–	–	–	–	–	–	–
CO2	3	2	1	1	–	–	–	–	–	–	–	–
CO3	3	2	2	1	–	–	–	–	–	–	–	–
CO4	2	3	1	1	–	–	–	–	–	–	–	–
CO5	3	2	2	1	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

	PSO1	PSO2	PO 3
CO1	2	2	1
CO2	2	2	1
CO3	2	3	2
CO4	2	–	3
CO5	2	–	–

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 wire less 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 Understand Basics of Network Devices

CO3 To Understand Basics of Network, Transport and Application Layers

CO4 To Apply 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 • WhatIs a WAN?, WAN Switching, WAN Switching techniques Circuit Switching,PacketSwitchingetc., • ConnectingtotheInternet:PSTN,ISDN,DSL,CATV,Satellite- BasedServices,LastMileF ibre,Cellular

	Technologies • ConnectingLANs:LeasedLines,SONET/SDH,PacketSwitching,RemoteAccess:Dial-upRemoteAccess, • VirtualPrivateNetworking,SSLVPN,RemoteTerminalEmulation,Networksecurity:Authenticationand • Authorization,TunnelingandEncryptionProtocols,IPSec,SSLandTLS,Firewall,OtherSecurity • Appliances, Security Threats • Conclusion and Summary ofUnit
5.	**Network Operating Systems and Trouble shooting Network**
	• Introduction of Unit • NetworkOperatingSystems:MicrosoftOperatingSystems,NovellNetWare,UNIXandLinuxOperating • Systems, Macintosh Networking • TroubleShootingNetworks:Command-LineinterfaceTools,NetworkandInternetTroubleshooting,Basic • Network • Troubleshooting:TroubleshootingModel,identifytheaffectedarea,probablecause, • implementasolution,testtheresult,recognizethepotentialeffectsofthesolution,documentthesolution • UsingNetworkUtilities:ping,traceroute,tracert,ipconfig,arp,nslookup,netstat,nbtstat,Hardwaretrouble • 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

D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	–	–	–	–	–	–	–	–
CO2	3	3	1	1	–	–	–	–	–	–	–	–
CO3	2	2	1	1	–	–	–	–	–	–	–	–
CO4	2	2	2	1	–	–	–	–	–	–	–	–
CO5	2	2	2	1	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	—	2	2
CO2	—	3	2
CO3	—	1	2
CO4	—	—	3
CO5	—	—	2

Code: BERCEE4104 ELELCTRONIC DEVICES AND CIRCUITS 3 Credits [LTP: 3-0-0]

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 oftransistor
- 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 aswitch. 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 Circuittheory	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

CO1 Illustrate the solution methods of transcendental and algebraic equations like Secant, Regula Falsi, Successive iteration method, Newton-Raphson etc.

CO2 Evaluate numerical differentiation methods, numerical integration methods and derivation of general Quadra ture formulas.

CO3 Differentiate between differences and derivatives, divided difference and curve fitting.

CO4 Analyze the linear equations and various methods to solve them like Gauss

CO5 Solve Finite Difference Method for ordinary and Partial differential equation with solution of elliptical equation for various boundary condition.

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.Raifou ndation.org
□ https://nptel.ac.in/courses/106105153/

D. CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	–	–	–	–	–	–	–	–
CO2	1	2	2	1	–	–	–	–	–	–	–	–
CO3	1	3	2	1	–	–	–	–	–	–	–	–
CO4	1	3	2	1	–	–	–	–	–	–	–	–
CO5	1	3	2	1	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	–	–	2
CO2	2	1	1
CO3	–	2	3
CO4	–	1	3
CO5	–	2	3

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

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

CO1 Use the 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 handlingDeadlocks, • Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery fromDeadlock. • Conclusion and Summary of Unit
4.	**Storage Manage ment**
	• Introduction of Unit • Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. • VirtualManagement:Demandpaging,Processcreation,PageReplacementAlgorithms,Allocationof 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-SystemImplementation:File-Systemstructure,File-SystemImplementations,DirectoryImplementation,Allocation Methods, Free-space Management, Efficiency and Performance ,Recovery. • DiskManagement:DiskStructure,DiskScheduling,DiskManagement,Swap-SpaceManagement,DiskAttachment, stable-storage Implementation • Conclusion and Summary of Unit
5.	**Protection and Security**
	• Introduction of Unit • Protection:GoalsofProtection,DomainofProtection,AccessM atrix,ImplementationofAcessM atrix,Revocat ion 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. **RECO MMENDEDSTUDYMATERIAL:**

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(WILEYP ublic ation)
4.	Operating System	William Stallings	Latest	4 th Edition, Pearson Education.

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D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	–	3	3	–	–	–	–	–	–	–
CO2	2	2	–	2	2	–	–	–	–	–	–	–
CO3	1	3	–	3	3	–	–	–	–	–	–	–
CO4	2	1	–	2	2	–	–	–	–	–	–	–
CO5	2	2	–	1	2	–	–	–	–	–	–	–

E. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	3	–	–
CO2	3	–	–
CO3	1	1	3
CO4	2	2	3
CO5	1	–	3

Code: BER EEE4113 ENERGY AND ENVIRONMENT MANAGEMENT 3 Credit [LTP: 3-0-0]

COURSE OUTCOMES: 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 Applying the concept of Basic Electrical Systems, Bill Analysis, Lighting Systems and Transformers and Electric Distribution

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

CO4 Interpreting the 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 THE COURSE:

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

B. DETAILED SYLLABUS:

Unit	Unit Details
1.	**Energy Auditing Techniques**
	• Introduction of Unit • EnergyAuditingTechniques:Definition,Energyaudit-need,Typesofenergyaudit,Energymanagement(audit)approach-understanding energy costs, Bench marking, Energy performance, Matching energy useto • Requirement,Maximizingsystemefficiencies,optimizingtheinputenergyrequirements,Fuelandenergysubstitution, Energy audit instruments. , • Methodologies of Conducting Energy Audit: Preliminary & Detailed Energy Audit Methodology: PreliminaryQuestionnaire,ReviewofPreviousRecords,IntroductoryMeeting,WalkthroughTour,FlowChartConstructionforDetailEnergyAudit,IdentificationofRequiredAuditInstruments,FinalizationofAuditScheduleWiththeCompany, Getting DetailedData. • EnergyAuditReport:OutlinesofEnergyAuditReportFormat,IdentificationandTechno economic • AnalysisofEnergy Conservation Measures, Classification of Energy ConservationMeasures • Conclusion and Summary ofUnit
2.	**Basic ElectricalSystems**

	• 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, green house gases and global warming; Climate change–causes and consequences; Carbon footprint; Management of green house 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,industrialsystemsandenvironment:Agriculturalandindustrialsystemsvisà-visnaturalecosystems;Agricultural systems, and environment and natural resources; Industrial systems andenvironment • Energytechnologiesandenvironment:Electricalenergyandsteamenergy;Fossilfuels,hydropowerand nuclearenergy; Solar energy, wind energy and biofuels; Wave, ocean thermal, tidalenergy and ocean currents; Geothermal energy; Future energy sources; Hydrogen fuels; Sustainableenergy

C. RECOMMENDED STUDY MATERIAL

Sr.No	ReferenceBook	Author	Edition	Publication
1.	Bharucha, E., Textbook of Environmental Studies	Bharucha	2nd	UniversitiesPress
2.	Ecology-Principles andApplication	Chapman, J.L. and Reiss, M.J	1st	CambridgeUniversityPress(LPE)
3.	EnvironmentalStudies	Joseph,B	1st	TataMcGraw-Hill
4.	D.R.EnergyEfficiencyforEngineersandTechnologists	Eastop, T.P. andCroft	2nd	Longman andHarow
5.	EnvironmentalScience	Miller,G.T	2nd	Thomson
6.	EnergyManagement	O'Callagan	3rd	McGrawHillBookCo.Ltd
7.	Generation Of Electrical Energy Edition 2005	B.R.Gupta	1st	EurasiaPublishingHouse(PVT.) LTD. RamNagar
Websites				

- www.khanacademics.com
- www.mindtools.com
- www.tryscience. com
- www.khaki.com
- www.tryingineering.com
- www.Raifoundation.org
- https://nptel.ac.in/courses/127/106/127106004/

D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	–	–	–	–	–	–	–	1	–	3	–	2
CO2	–	–	–	–	–	–	–	1	–	3	–	2
CO3	–	–	–	–	–	–	–	2	–	1	–	1
CO4	–	–	–	–	–	–	–	2	–	2	–	1
CO5	–	–	–	–	–	–	–	1	–	3	–	2

E. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	–	–	3
CO2	–	2	–
CO3	–	3	3
CO4	–	3	3
CO5	–	–	3

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

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

CO1 Cite Conventional and Non-conventional Energy Sources.

CO2 Approximate the concept of Power Plant Economics.

CO3 Correlate Supply System &Distribution System.

CO4 Assess Parameters of Transmission Lines

CO5 Conclude 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 hydro electric 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 ofUnit
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 Of conductor and losses. Comparison of DC 2- wire, DC 3-wire, 1-phase AC and 3-phase AC (3-Systems. • Distribution Systems: Primary and secondary distribution systems, feeder, distributor and service • 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 ofUnit • Insulators: Pin, shackle, suspension, post and strain insulators. Voltage distribution acrossan • methods of improving string efficiency. • Underground Cables: Conductor, insulator, sheathing and armoring materials. Types of cables. • capacitance calculation. Electrostatic stresses and reduction of maximum stresses. Causes of • of cable. • Introduction to oil filled and gas filledcables. • Conclusion and Summary of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Generation of Electrical Energy (4/e)	B. R.Gupta	Latest	S. ChandPublication
2.	Electrical Power(13/e)	S. L.Uppal	Latest	KhannaPublishers

3.	Electric Power Transmission and Distribution,	S.Sivanagarajuand S.Satyanarayana	Latest	PearsonPublisher.
4.	: Electric Power Distribution	A. S.Pabla	Latest	MGH.

Websites

- khanacademy.com
- https://nptel.ac.in/courses/108/106/108106163/

D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	–	–	–	–	–	–	–	–
CO2	3	2	1	3	–	–	–	–	–	–	–	–
CO3	3	3	2	2	–	–	–	–	–	–	–	–
CO4	3	2	1	3	–	–	–	–	–	–	–	–
CO5	2	2	2	3	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	–	–	2
CO2	–	–	3
CO3	–	–	3
CO4	–	–	2
CO5	–	–	3

Code: BERCCE5103 MICROPROCESSOR AND MICROCONTROLLER 3 Credits[LTP:3-0-0]

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

CO1	Explain and inspect microprocessor.
CO2	Examine data transfer instructions, arithmetic instructions, Logical instructions in microprocessor.
CO3	Examine the Fundamental ofI /O, Programmed and interrupt I/O, parallel communication interface for 8086 microprocessor
CO4	Explain 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:Architecture • 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 STUDY MATERIAL:

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	Micro processors And
6.	The8051Microcontroller and Embedded Systems	Mazidiand Mazidi	Pearson Education	The 8051 Microcontroller and
7.	The 8051Microcontroller	Kenneth	Thomson	The 8051Microcontroller
8.	Microprocessor Architecture, Programming and	Ramesh S.Gaonkar	Penram	Micro processor Architecture,

Websites

- https://nptel.ac.in/courses/108/107/108107142/
- https://nptel.ac.in/courses/108/103/108103157/

C. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	–	–	–	–	–	–	–	–
CO2	2	2	2	1	–	–	–	–	–	–	–	–
CO3	1	3	1	3	–	–	–	–	–	–	–	–
CO4	1	2	1	3	–	–	–	–	–	–	–	–
CO5	3	2	1	1	–	–	–	–	–	–	–	–

D. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	–	3	2
CO2	–	2	3
CO3	2	3	3
CO4	3	2	2
CO5	1	2	3

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

COURSE OUTCOMES: 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 Describe 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 bius 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 STUDY MATERIAL:

Sr. No	Reference Book	Author	Editio	Publication
1.	Power Electronics, Circuits Devices and Applications	M HRashid	3	PHI
2.	Power Electronics	NedMohan	3	JohnWiley
3.	Power Electronics	M D Singh Khanchandani	2	TMH
4.	Elements of Power Electronics	Krein P.T	2	Oxford
5.	Power Electronics	P CSen	3	TMH

Website :

- https://nptel.ac.in/courses/108/105/108105066/
- https://nptel.ac.in/courses/108101038/

D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	–	–	–	–	–	–	–	–
CO2	2	2	1	1	–	–	–	–	–	–	–	–
CO3	3	2	1	1	–	–	–	–	–	–	–	–

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

E. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	1	1	3
CO2	2	2	3
CO3	3	1	3
CO4	–	1	3
CO5	–	1	3

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

COURSEO UTCO MES: After Successful completion of the course students will be able to-

CO1 Study the idea of intelligent agents and search methods.

CO2 Study about representing knowledge

CO3 Study the reasoning and decision making in uncertain world.

CO4 Construct plans and methods for generating know ledge.

CO5 Study the concepts of expert systems.

A. OUTLINE OF THECO URSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to AI	7
2.	Know ledge and Reasoning	9
3.	Uncertain Know ledge 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.	**Knowle dge 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 Knowle dge and Reasoning**
	• Introduction to unit • Uncertainty, Acting under uncertainty • Basicprobabilitynotation,Axiomsofprobability,Baye'srule,Probabilisticreasoning,Makingsimpl • Conclusion and Summary ofUnit
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 STUDY MATERIAL:

Sr. No	ReferenceBook	Author	Editio	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

D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	–	–	–	–	–	–	–	–
CO2	2	2	1	1	–	–	–	–	–	–	–	–
CO3	3	2	1	1	–	–	–	–	–	–	–	–
CO4	3	2	1	1	–	–	–	–	–	–	–	–
CO5	3	2	1	1	–	–	–	–	–	–	–	–

F. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	1	1	3
CO2	2	2	3
CO3	3	1	3
CO4	–	1	3
CO5	–	1	3

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

COURSEO UTCO MES: 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 DesignthechargecontrollersforPVsysteminextractingmaximumpowerfromthePV
CO5 Develop an efficient PV system for betterment of society

A. OUTLINE OF THECO URSE

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 STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Expert Handbook for Planning, Design and Installation	NA	NA	EarthscanLtd
2.	Solar Water and Pool Heating Manual	NA	NA	Florida Solar EnergyCenter
3.	Planning and Installing Solar Thermal Systems:AGuide for Installers,	NA	NA	KindleeBook
Websites				
	https://nptel.ac.in/courses/103107157/ https://nptel.ac.in/courses/112105051/			

D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	1	–	–	–	–	–	–	–	–
CO2	3	2	1	1	–	–	–	–	–	–	–	–
CO3	3	3	1	1	–	–	–	–	–	–	–	–
CO4	2	1	2	1	–	–	–	–	–	–	–	–
CO5	3	2	2	2	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	–	–	–
CO2	–	–	2
CO3	–	–	3
CO4	–	–	3
CO5	–	–	2

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

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

- Understand hydrogen production methods.
- Understand how to store hydrogen.
- Learn working principle of fuel cells.
- Be familiar with fuel cell types.
- Can find the applications of all the areas in day to day life.

A. OUTLINE OF THECO URSE

Unit	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 solidoxide, 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 STUDY MATERIAL:

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/			

D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	1	–	–	–	–	–	–	–	–
CO2	3	2	1	1	–	–	–	–	–	–	–	–
CO3	2	3	1	1	–	–	–	–	–	–	–	–
CO4	2	1	2	1	–	–	–	–	–	–	–	–
CO5	3	2	2	2	–	–	–	–	–	–	–	–

F. CO-PSO Mapping

	PSO1	PSO2	PO3
CO1	–	–	–
CO2	–	–	2
CO3	–	–	3
CO4	–	–	3
CO5	–	–	2

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 distanceprotection. •

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: B E R C E E 5 2 0 4 INDUSTRIAL TECHNICAL SEMINAR - 1 Credits [LTP: 0-0-2]

LAB 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) byBoard of Examiners to be appointed by the Faculty Coordinator-Training Seminar who will award thegrades

A. COs AND POs MAPPING

COs and POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	2	-	2	-	1	1	1	-	-	-	-	1
CO.2	2	-	3	2	-	-	-	-	-	-	-	-
CO.3	-	1	1	-	2	2	-	-	-	-	-	-
CO.4	2	2	3	-	-	-	-	-	-	-	-	-
CO.5	-	-	3	-	2	2	-	-	-	-	-	-

B. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO.1	3		-	-	2
CO.2	-	-	2	2	2
CO.3	2		2	-	1
CO.4	2		-	2	-
CO.5	-		2	-	2

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	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: BERCCE7103 Data Base management System 3.0 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: 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: 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

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/