

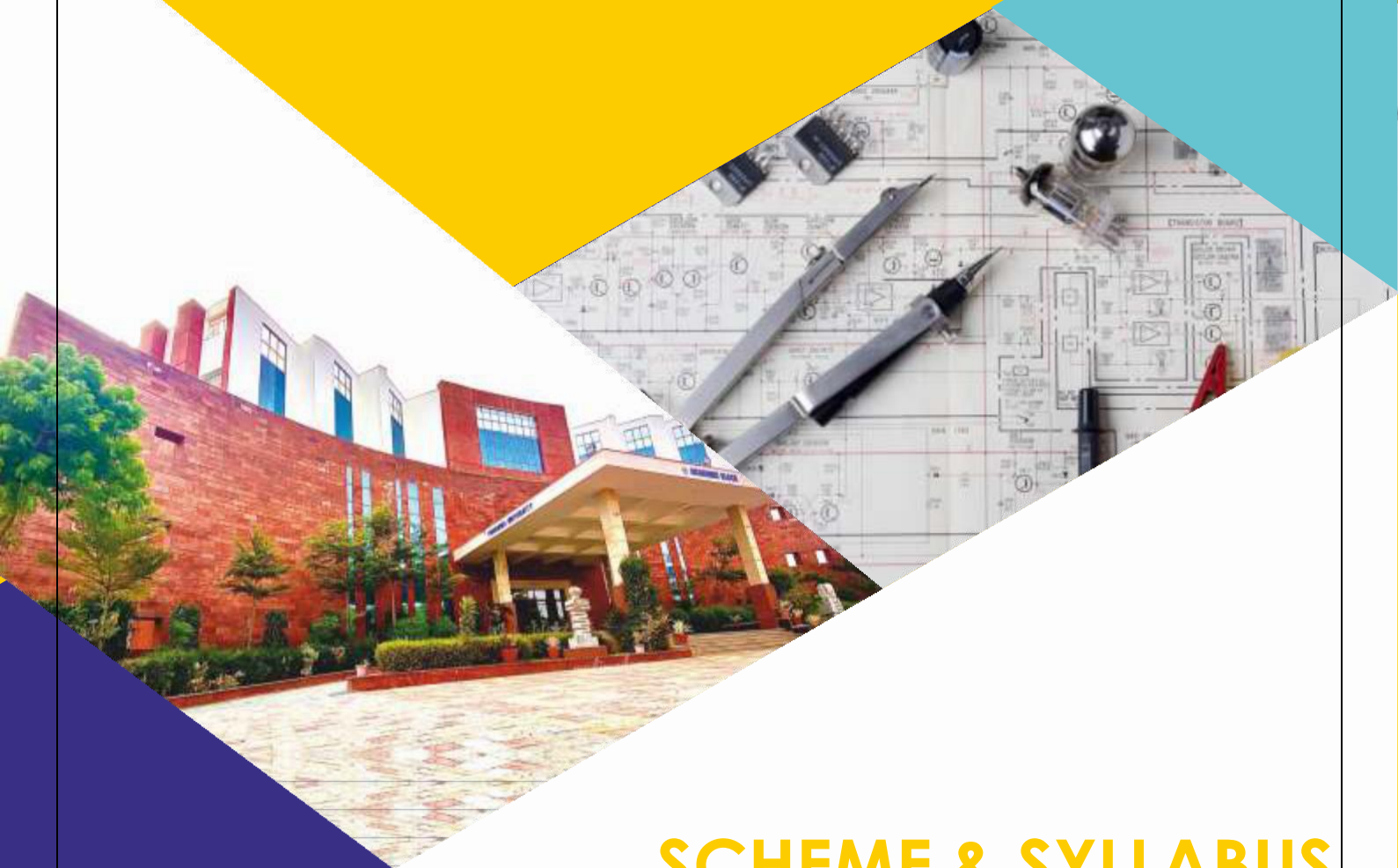


Your Dreams Our Goal
POORNIMA
UNIVERSITY

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 2024-2028

SCHEME & SYLLABUS

BATCH: 2024-28

INDEX

S. No	Contents	Page No.
1	Vision, Mission And Quality Policy Of University	
2	Knowledge Wheel	
3	Preamble	
4	About Program and Program Outcomes (POs)	
5	Examination System	
6	Assessment & Grade Point Average: SGPA, CGPA	
7	Guidelines for MOOC Courses	
8	Teaching Scheme of all Semesters	
9	Teaching Syllabus of all Semesters	

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:



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VISION

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

Mission

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

Quality Policy

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

Knowledge Wheel

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



About Program and Program Outcomes (PO):

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

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

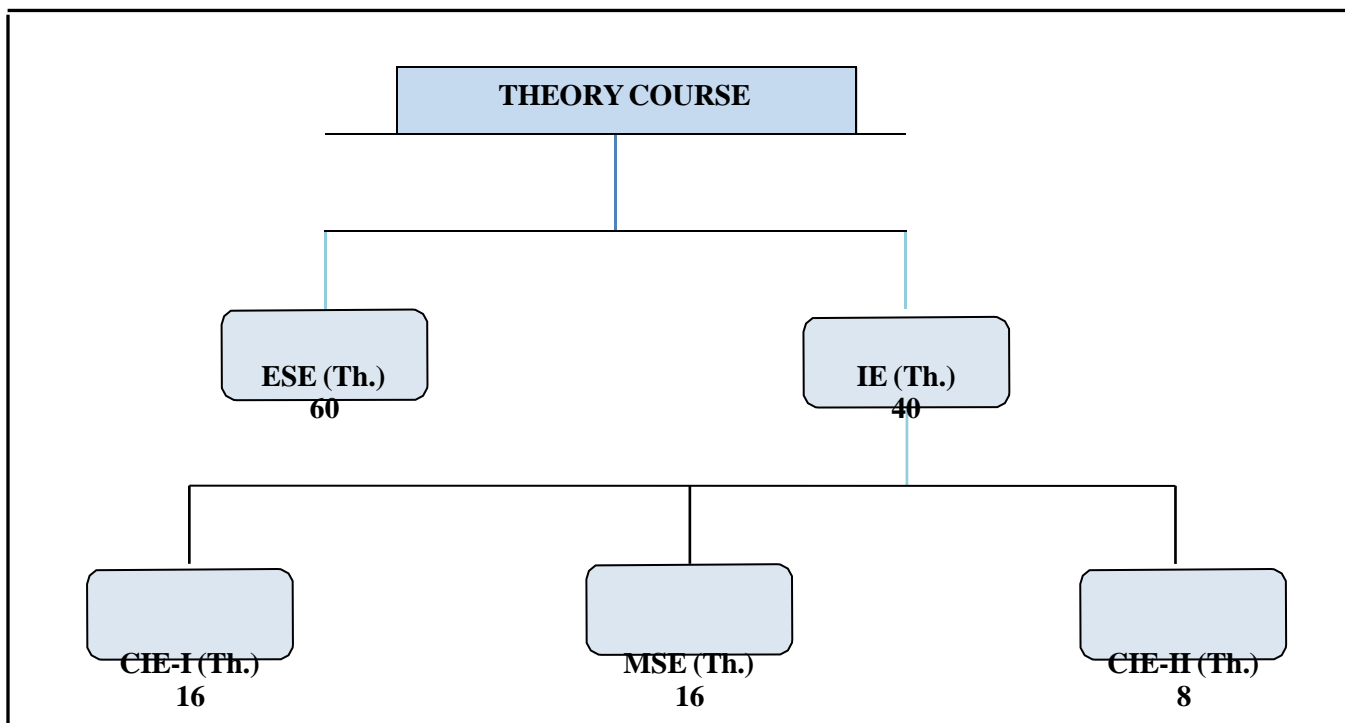
Program Outcomes (PO) :

Engineering Graduates will be able to:

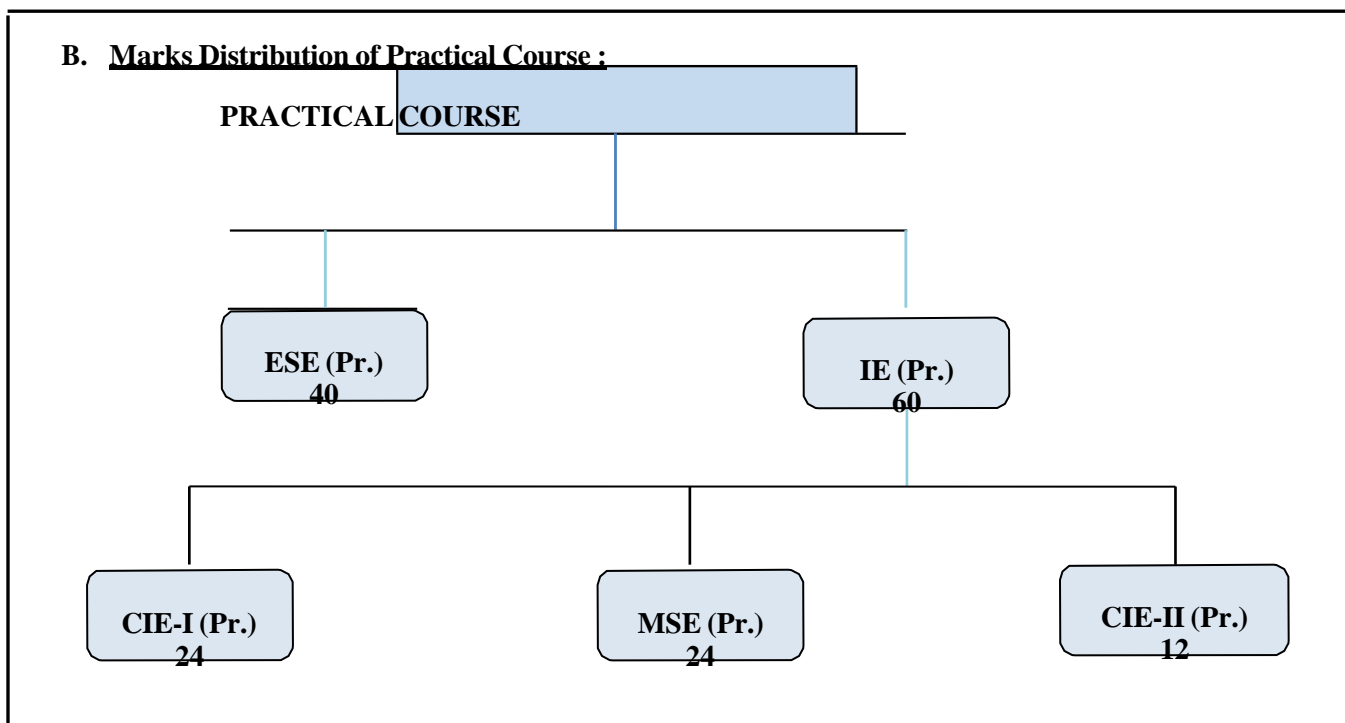
- A. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- B. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems 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

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

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

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

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

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

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				Applicable for All courses except B.Arch. & Ph.D.			
Academic Performance	Grade	Grade Point	Marks Range (in %)	Academic Performance	Grade	Grade Point	Marks Range (in %)
Outstanding	O	10	$90 \leq x \leq 100$	Outstanding	O	10	$90 \leq x \leq 100$
Excellent	A+	9	$80 \leq x < 90$	Excellent	A+	9	$80 \leq x < 90$
Very Good	A	8	$70 \leq x < 80$	Very Good	A	8	$70 \leq x < 80$
Good	B+	7	$60 \leq x < 70$	Good	B+	7	$60 \leq x < 70$
Above Average	B	6	$50 \leq x < 60$	Above Average	B	6	$50 \leq x < 60$
Fail	F	0	$x < 50$	Average	C	5	$40 \leq x < 50$
Absent	Ab	0	Absent	Pass	P	4	$35 \leq x < 40$
				Fail	F	0	$x < 35$
				Absent	Ab	0	Absent

CGPA to percentage conversion rule:

$$\text{Equivalent \% of Marks in the Program} = \text{CGPA} * 10$$

Award of Class

CGPA	Percentage	Equivalent Division
$7.50 \leq \text{CGPA}$	75% or more	First Division with Distinction
$6.00 \leq \text{CGPA} < 7.50$	$60\% \leq x < 75\%$	First Division
$5.00 \leq \text{CGPA} < 6.00$	$50\% \leq x < 60\%$	Second Division
$4.00 \leq \text{CGPA} < 5.00$	$40\% \leq x < 50\%$	Pass Class

Guidelines for Massive Open Online Courses (MOOCs)

(Session 2024-28)

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 2024-28 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 2024-28 onwards):

Open Elective (for batches entered till 2022) / Multidisciplinary Courses (for batches admitted from 2024-28 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 Computer Science and Engineering
Faculty of Engineering and Technology

Name of Program: B.Tech. (Common for all) Duration: 4 Years Total

Credits:171

Teaching Scheme for Batch 2024-28

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/ BTXCCE1103	Engineering Physics / Engineering Chemistry	3	-	-		40	60	100	3	
BTXCCE1103	Fundamental of Computer	3	-	-		40	60	100	3	
BTXCCV1104/ BTXCCE1105	Basics of Civil Engineering / Basics of Electrical and Electronics Engineering	3	-	-		40	60	100	3	
BTXCSA1106/ BTXCME1107	Engineering Mathematics / Basic of Mechanical Engineering	3	-	-		40	60	100	3	
A.2	Practical									
BTXCSA1201/ BTXCSA1202	Engineering Physics lab / Engineering Chemistry	-	-	2		60	40	100	1	
BTXCCE1203	Programming in C Lab	-	-	2		60	40	100	1	
BTXCCV1204/ BTXCCE1205	Computer Aided Design (CADD)/ Basics of Electrical and Electronics Engineering Lab	-	1	2		60	40	100	1	
BTXCME1206/ BTXCME1207	Workshop Practice/ Engineering Graphics	-	1	2		60	40	100	1	
BTXCCE1208	Exploratory Project	-	-	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)								
BUACHM1202	Foundation English	-	-	2		60	40	100	1	
E		Skill Enhancement Courses (SEC)								
BULCSE1201	Skill Enhancement Generic Course-I	-	-	2		60	40	100	1	
F		Value Added Courses (VAC)								
BUVCVE1102	Environmental Studies	2	-	-		40	60	100	2	
G		Summer Internship / Research Project / Dissertation								
Total		14	2	14					21	
Total Teaching Hours		30								

POORNIMA UNIVERSITY, JAIPUR									
Faculty of Engineering and Technology									
Name of Program: B.Tech. in Electrical and Computer Engineering					Duration: 4 Years				
Total Credits: 171									
Teaching Scheme for Batch 2024-28									
Semester-III									
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								
BERCSA3101	Engineering Mathematics - II	3	0	0		40	60	100	3
BERCEE3102	Electrical Machines	3	0	0		40	60	100	3
BERCEE3103	Electronic Measurement and Instrumentation	3	0	0		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		60	40	100	1
BERCCE3205	JAVA LAB	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		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)							
BUACHM3209	Professional Skills-I	0	0	2		40	60	100	1
E		Skill Enhancement Courses (SEC)							
BULCSE3201	Skill Enhancement Generic Course-III	0	0	2		60	40	100	1
F		Value Added Courses (VAC)							
BUVCVE3104	Green Built Environment	2	0	0		40	60	100	2
G		Summer Internship / Research Project / Dissertation							
	-	16		14					23
Total Teaching Hours		30/30							

POORNIMA UNIVERSITY, JAIPUR

Faculty of Engineering and Technology

Name of Program: B.Tech. in Electrical and Computer Engineering **Duration: 4 Years**
Total Credits: 171

Teaching Scheme for Batch 2024-28

Semester-IV

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								
BERCEE4101	Electrical Circuit and Analysis	3	1	0		40	60	100	4
BERCEE4102	Control Systems	3	0	0		40	60	100	3
BERCEE4103	Computer Networks	3	0	0		40	60	100	3
BERCEE4104	Electronic Device and Circuit	3	0	0		40	60	100	3
A.2	Practical								
BERCEE4201	Control and Automation Lab	0	0	2		60	40	100	1
BERCEE4202	OOPS With JAVA LAB	0	0	2		60	40	100	1
BERCEE4203	Computer Networks Lab	0	0	2		60	40	100	1
		Minor Stream Courses / Department Electives							
B.1	Theory								
BERECE4111	Object Oriented Programming								
BERECE4112	Operating Systems	3	0	0		40	60	100	3
BERECE4113	Energy and Environment								
B.2	Practical								
C		Multidisciplinary Courses (MC)							
BEREBX4109	MOOC Course-III	2	0	0		40	60	100	2
D		Ability Enhancement Courses (AEC)							
23BULCHU4212	Communication Skills -II	0	0	2		60	40	100	1
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	1
F		Value Added Courses (VAC)							
	-	-	-	-					
G		Summer Internship / Research Project / Dissertation							
Total		17	1	12					24
Total Teaching Hours		30/30							24

POORNIMA UNIVERSITY, JAIPUR

Faculty of Engineering and Technology

Name of Program: B.Tech. in Electrical and Computer Engineering
Total Credits: 171

Duration: 4 years

Teaching Scheme for Batch 2024-28

Semester-V

Course Code	Name of Course	Teaching Scheme				Marks Distribution			Credits
		Lecture	Tutorial (T)	Practical (P)	SH	IE	ESE	Total	
A.		Major (Core Courses)							
A.1	Theory								
BERCEE5101	Electrical Power Generation, Transmission and Distribution	3	0	0		40	60	100	3
BERCEE5102	Power Electronics and Drives	3	0	0		40	60	100	3
BERCEE5103	Microprocessor and Microcontrollers	3	0	0		40	60	100	3
BERCEE5104	Artificial Intelligence & Expert System	3	0	0		40	60	100	3
A.2	Practical								
BERCEE5201	Microprocessor and Microcontroller Lab	0	0	2		60	40	100	1
BERCEE5202	Power Electronics and Drives Lab	0	0	2		60	40	100	1
BERCEE5203	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)								
BERECE5111	Embedded System & IOT	3	0	0		40	60	100	3
BEREEEB5112	Hydrogen Energy and Fuel Cells								
BEREEEB5113	Switchgear and Protection								
B.2	Practical								
C		Multidisciplinary Courses							
BEREBX5109	MOOC Course-IV	2	0	0					2
D		Ability Enhancement Courses (AEC)							
BUACHM5216	Professional Skills II	0	0	2		60	40	100	1
E		Skill Enhancement Courses (SEC)							
BULCSE5201	SETC-I	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					
Total Teaching Hours		30/30							24

POORNIMA UNIVERSITY, JAIPUR

Faculty of Engineering and Technology

Name of Program: B.Tech. in Electrical and Computer Engineering Duration: 4 Years
Total Credits: 171

Teaching Scheme for Batch 2024-28

Semester-VI

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								
BERCCE6101	Theory and Practical Aspect of Machine Learning	3	0	0		40	60	100	3
BERCEE6102	Power System Analysis	3	1	0		40	60	100	4
BERCCE6103	Data Base management System	3	0	0		40	60	100	3
BERCCE6104	Computational Theory and Compiler Design	3	0	0		40	60	100	3
A.2	Practical								
BERCEE6201	Power System Lab	0	0	2		60	40	100	1
BERCCE6202	Natural Language processing	0	0	2		60	40	100	1
BERCCE6203	DBMS Lab	0	0	2		60	40	100	1
BERCCE6204	Compiler Design Lab	0	0	2		60	40	100	1
BERCCE6205	Cloud Computing Lab	0	0	2		60	40	100	1
B.		Minor Stream Courses/ Department Electives							
B.1	Theory (Any One)								
BEREEE6111	Solar Thermal Engineering Processes	3	0	0		40	60	100	3
BEREEE6112	EHV AC/DC Transmission								
BERECE6113	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							
BERCEE6301	Minor Project	0	0	4		60	40	100	2
Total		15	1	14					23
Total Teaching Hours		30 / 30							

POORNIMA UNIVERSITY, JAIPUR										
Faculty of Engineering and Technology										
Name of Program: B.Tech. in Electrical and Computer Engineering							Duration: 4 Years			
Total Credits: 171										
Teaching Scheme for Batch 2024-28										
Semester-VII										
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									
BERCEE7101	MOOC Course-V	3	0	0		40	60	100	3	
A.2	Practical									
BERCEE7201	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								
BERCEE7401	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: 171

Teaching Scheme for Batch 2024-28

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
BERCEE8102	Digital Image Processing	3	0	0		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
BERCEE8203	Computer Vision Lab	0	0	2		60	40	100	1
B.		Minor Stream Courses/Department Electives							
B.1	Theory								
BERECE8111	Optimization Theory								
BEREEE8112	Power System operation and Control	3	0	0		40	60	100	3
BERECE8113	Cryptography and Network Security								
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					22
Total Teaching Hours		30/30							

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (CO):	At the end of this course, learners will be able to:	Bloom Level	PO Mapping
CO1	Differentiate between the Diamagnetism, Para magnetism and ferromagnetism	L1	PO1, PO2, PO3, PO4, PO6, PO7
CO2	Understand the principle behind Newton's rings interference pattern, its construction using a plano-convex lens and a flat glass plate	L1	PO1, PO2, PO3, PO4, PO6, PO7
CO3	Explain the concept of matter waves and describe their wave-particle duality using the de Broglie wavelength equation.	L1	PO1, PO2, PO3, PO4, PO6, PO7
CO4	Provide a solid foundation for understanding the principles behind many electronic devices and applications like Hall effect, PN Junction	L3	PO1, PO2, PO3, PO4, PO5, PO6, PO7
CO5	Comprehensive foundation in the principles and applications of light amplification, He-Ne laser, and holography	L3	PO1, PO2, PO3, PO4, PO6, PO7

B. MAPPING MATRIX OF CO,PO, & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-	2	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	1	-	-
WT. AVG	2.6	2.4	2.2	-	-	-	-	-	-	-	-	-	2.4	-	-

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	-	-	-	-	1
CO2	-	-	-	-	1
CO3	-	-	-	-	1
CO4	-	-	-	-	1
CO5	-	-	-	-	1
Wt. AVG	-	-	-	-	1

D. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Material Science	09
2.	Wave optics	09
3.	Quantum Mechanics	09
4.	Semiconductor Physics	09
5.	Laser and Holography	09

E. DETAILED SYLLABUS

Unit	Unit Details
1.	Material Science
	<ul style="list-style-type: none">• Introduction of Unit• Fundamentals of Crystal structure,• Para-magnetism, Diamagnetism, Ferromagnetism, Ferrimagnetism, Antiferromagnetic, Magnetic Permeability, Magnetization, Paramagnetic Susceptibility of Solid Substances, and Explanation of Hysteresis.• Conclusion of Unit
2.	Wave optics
	<ul style="list-style-type: none">• Introduction of Unit• Interference of light, Types of Interference, coherent source, methods to produce coherent sources with examples.• Newton's rings: Principle, Construction, working and Applications, Anti Reflection Coating.• Fundamental idea about optical fiber, types of fiber, acceptance angle, numerical aperture.• Conclusion of Unit
3.	Quantum Mechanics
	<ul style="list-style-type: none">• Introduction of Unit• Matter waves and properties. Group and Particle velocities & their relationship.• Compton scattering, wave function and its properties.• Energy and momentum operators.• Time dependent and time independent Schrodinger wave equation.• Conclusion of Unit
4.	Semiconductor Physics
	<ul style="list-style-type: none">• Introduction of Unit• Energy bands in semiconductors,• Types of semiconductors, Charge carriers,• Intrinsic and extrinsic materials, Carrier Concentration, Conductivity and Mobility,• Hall effect,• PN Junction diode, Zener diode, Solar Cells• Conclusion of Unit
5.	Laser and Holography
	<ul style="list-style-type: none">• Introduction of Unit• Introduction of LASER, Conditions for the Light Amplification,• Population Inversion and metastable state, pumping.• Types of lasers: He-Ne laser and diode laser and their working principle and Holography• Conclusion of Unit

F. RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1	Materials Science and Engineering	by Raghavan V	Latest	PHI

2	Fundamentals Of Engineering Physics	SS Rawat	Latest	CBH Publications
3	Solid State Physics	By S. O. Pillai	Latest	NEW AGE
4	Concepts of modern physics	Beiser, Arthur	Latest	Mc Graw Hill
5	<i>Introduction to Quantum Mechanics</i>	David J. Griffiths and Darrell F. Schroeter	Latest	Cambridge University Press
Important Web Links				
1	https://jiet.claybits.com/			
2	https://jiet.claybits.com/physics/1-5			
3	https://jiet.claybits.com/physics/3-1			

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Enumerate the importance, synthesis and applications of polymers.	L2	PO1, PO2, PO3, PO4, PO6, PO7
CO2	Illustrate the fundamental principles of water chemistry, applications of volumetric and analytical instrumentation	L1	PO1, PO2, PO3, PO4, PO6, PO7
CO3	Explain the fundamental concepts of corrosion, its control and surface modification methods namely electroplating and electroless plating	L2	PO1, PO2, PO3, PO4, PO6, PO7
CO4	Impart the basic knowledge of chemistry and its principles involved in electrochemistry, energy storage devices and its commercial applications	L3	PO1, PO2, PO3, PO4, PO5, PO6, PO7
CO5	Learn about the manufacturing of cement and the chemistry involved in setting and hardening of it and also learn about the suitable use of lubricants	L2	PO1, PO2, PO3, PO4, PO6, PO7

B. Mapping matrix of CO & PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	1	1	1	-	1	1	-	-	-	-	-
CO2	2	1	2	1	-	2	2	-	-	-	-	-
CO3	3	2	2	1	-	2	2	-	-	-	-	-
CO4	3	1	2	1	1	2	2	-	-	-	-	-
CO5	2	1	1	1	-	2	2	-	-	-	-	-
Wt. AVG	2.6	1.2	1.6	1	1	1.8	1.8					

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO 3	PSO4	PSO5
CO1	-	-	-	-	1
CO2	-	-	-	-	1
CO3	-	-	-	-	1
CO4	-	-	-	-	1
CO5	-	-	-	-	1
Wt. AVG	-	-	-	-	1

D. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Polymer Basics and Applications	7
2.	Water Chemistry and methods of analysis	7
3.	Corrosion and Metal finishing	7
4.	Electrochemistry and energy storage systems	8
5.	Engineering Materials	7

E. DETAILED SYLLABUS

Unit	Unit Details
1.	Polymer Basics and Applications
	<ul style="list-style-type: none"> • Introduction of Unit • Introduction to Polymer chemistry: , • Classification of Polymers and Types of polymerization • Plastics: Thermosets and Thermoplastics, Preparation, Properties and Uses of Polyethylene, Bakelite, Teflon, and Nylon • Single use plastic: chemical composition, usage, disposal, and impacts • Nanoplastics and Human Health • Flexible materials: Natural rubber, Vulcanization, Synthetic rubber- Preparation, Properties and Applications of SBR, Buna-N and flexible materials. • Conclusion of Unit
2.	Water Chemistry and Methods of Analysis
	<ul style="list-style-type: none"> • Introduction of Unit Water • Sources of water, Impurities in water and effect of impurities • Municipal water supply: Requisites of drinking water, Alkaline Water: Benefits, Side Effects And Dangers • Steps involved in purification of water, Sedimentation, Coagulation, Filtration and Disinfection, Break Point Chlorination • Water Analysis • Hardness of water; Type of hardness , Degree of hardness, Units of hardness ,Disadvantages of hard water, Determination of hardness by Complexometric (EDTA) method , Numericals based on hardness by EDTA method • Treatment of hard water: Lime-soda method, Permutit (zeolite) method, RO water treatment and Deionization or Demineralization method • Conclusion of Unit
3.	Corrosion and Metal Finishing
	<ul style="list-style-type: none"> • Introduction of the Unit • Definition of corrosion and its Significance • Mechanisms of Corrosion: Chemical (Dry) corrosion and Electrochemical (Wet) corrosion • Types of corrosion: Galvanic corrosion, Concentration cell corrosion, Stress corrosion, Pitting corrosion • Methods of protection against corrosion: Galvanization, Sacrificial coatings etc. • Metal finishing: Technological importance, Electroplating and Electroless plating • Conclusion of Unit
4.	Electrochemistry and Energy Storage Systems
	<ul style="list-style-type: none"> • Introduction of the Unit • EMF of cell, Free Energy, Single electrode potential, Nernst equation, Numerical problems based on Nernst Equation. • Electrodes: Calomel electrode and Glass electrode • Energy storage Systems: Introduction, Classification of batteries. Construction, working and applications of Li-ion batteries. • An electrochemical energy system for electric vehicles. Recycling of Lithium-ion batteries by direct cycling Method. • Conclusion & Real life applications.
5.	Engineering Materials
	<ul style="list-style-type: none"> • Introduction of the Unit

- Portland Cement; Definition, Manufacturing by Rotary kiln. Chemistry of setting and hardening of cement. Role of Gypsum.
- Lubricants: Classification, Mechanism, Properties; Viscosity and viscosity index, flash and fire point, cloud and pour point. Emulsification and steam emulsion number.
- Car and motorcycle engine oil: 0W-20 engine oil, 4T engine oil,
- Conclusion & Real life applications

RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Publication
1	Engineering chemistry: A Text book	S.K. Jain & K.D. Gupta	Jaipur Publishing House
2	Engineering chemistry: A Text book	S.S. Dara	S. Chand & Co
3	Engineering chemistry: A Text book	P.C. Jain	Dhanpat Rai & Sons.

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Learn data types, loops, functions, array, pointers, string, structures and files	L2	PO1, PO2, PO3, PO4, PO6, PO7
CO2	Develop conditional and iterative statements to write C programs	L1	PO1, PO2, PO3, PO4, PO6, PO7
CO3	Implement concept of string using array.	L2	PO1, PO2, PO3, PO4, PO6, PO7
CO4	Allocate memory dynamically using pointers	L3	PO1, PO2, PO3, PO4, PO5, PO6, PO7
CO5	Application of file handling and dynamic memory allocation	L2	PO1, PO2, PO3, PO4, PO6, PO7

B. Mapping matrix of CO & PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
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	-	-	-	-	-
Wt. AVG	2.6	2	1.8	1.8			1.8					

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-		
CO2	2	-	-		
CO3	2	-	-		
CO4	3	-	-		
CO5	2	-	-		
Wt. AVG	2.4				

D. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to C Programming	7

2.	Decision Making & Looping	7
3.	Array and string	7
4.	Advance programming in C	8
5.	File handling & Additional features	7

E. DETAILED SYLLABUS

Unit	Unit Details
1	Introduction to C Programming
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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

RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Publication
1.	Letus C, 6 th Edition	Yashwant Kanitkar	PBP Publication
2.	The C programming Language	Richie and Kenninghan	BPB Publication, 2004

3.	Programming in ANSI C3rd Edition, 2005	E.Balagurusamy	Tata McGraw Hill
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		

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (CO):	At the end of this course, learners will be able to:	Bloom Level
CO1	Understand the various aspect of civil engineering, its novel areas and Career Prospects in Civil Engineering.	L1
CO2	Demonstrate the characteristics of different Construction Materials and construction techniques in Civil Engineering.	L1
CO3	Identify the various building components, and analyze the construction methods and basic principles.	L4
CO4	Understand different types of surveying works required in construction and compare different surveying instruments.	L1
CO5	Understand about the recent advancements in Civil Engineering.	L1

A. MAPPING MATRIX OF CO,PO, & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	-	-	-	-	-	-	-	1	-	3
CO2	2	3	1	2	-	-	-	-	-	-	-	-	2	-	3
CO3	3	2	2	2	-	-	-	-	-	-	-	-	1	-	3
CO4	3	3	1	2	-	-	-	-	-	-	-	-	1	-	3
CO5	3	3	2	2	-	-	-	-	-	-	-	-	2	-	3
WT. AVG	2.8	2.6	1.6	1.8									1.6		3

B. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Introduction to Civil Engineering	08
2.	Construction Materials and techniques	08
3.	Building Construction	08
4.	Basic Surveying	08
5.	Advancements in Civil Engineering	08

C. DETAILED SYLLABUS

Unit	Unit Details
•	Introduction to Civil Engineering
	<ul style="list-style-type: none"> • Introduction • Different disciplines of Civil Engineering, Scope and prospects • Role of a Civil Engineer • Units of measurement, Unit conversion (Length, Area, Volume) • Infrastructure Engineering, Sustainability • Automation and Robotics in Construction • Novel areas in Construction industry • Career Prospects in Civil Engineering

•	Construction Materials and techniques
	<ul style="list-style-type: none"> • Introduction • Cement – Types, properties, grades, Concrete– PCC and RCC, Cement mortar • Stone, Requirements of good building stone, General types of stone used in Construction. • Bricks, Modular and Standard bricks, Characteristics of good brick, Field tests on Bricks, Special bricks –fly ash bricks. • Timber, Structure of timber, General properties and uses of good timber, Use of bamboo in construction • Asphalt, bitumen and tar used in construction, their properties and uses • Types of Stone Masonry (Rubble masonry, Ashlar Masonry) and Brick Masonry (English bond and Flemish bond).
•	Building Construction
	<ul style="list-style-type: none"> • Introduction • Classification of Buildings as per National Building Code Group A to I • Types of Constructions- Load Bearing Structure, Framed Structure, Composite Structure • Building Components - Functions of Building Components, Substructure-Foundation, Plinth & Superstructure. • Selection of site for different types of Buildings • Basic principles of building planning. • Pre-engineered steel building, Pre-fabricated buildings
•	Basic Surveying
	<ul style="list-style-type: none"> • Introduction • Survey – Principles, purpose and use • Types & Classification of surveying • Instruments used in chain survey: Chains, Tapes, Arrow, Ranging rod, Line ranger, Offset rod, Open cross staff, Optical square • Ranging: Direct and Indirect Ranging • Methods of chaining, obstacles in chaining. • Errors in chain and tape, Numerical based on errors in length due to incorrect length of chain & tape. • Modern surveying instruments– EDM, Total station, GPS
•	Advancements in Civil Engineering
	<ul style="list-style-type: none"> • Introduction • Smart city and it's features, Plastic Roads • Mass Transportation systems-BRTS, Metro • Rain water harvesting systems, Watershed Management • Green building, Energy efficient building • Development of River fronts, Heritage structures & its conservations • Affordable housing & their features • Building Information Modeling (BIM), 3D Printing Technology for Construction, Advanced Civil Engineering Materials

D. RECOMMENDED STUDY MATERIAL

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

•	Basic Civil Engineering	Arunachalam N	Latest	Pratheeba Publishers, Coimbatore
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Important Web Links

1	https://archive.nptel.ac.in/courses/105/106/105106201/
2	https://onlinecourses.nptel.ac.in/noc22_ce42/preview

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (CO):	At the end of this course, learners will be able to:	Bloom Level
CO1	Apply basic electrical concepts, including various circuit analysis techniques and fundamentals of theorem to solve numerical problem related to basic electrical circuit.	L4
CO2	Demonstrate the fundamentals of AC circuits and Electric Installation by calculating voltage, current, impedance, and power factors.	L1
CO3	Compare various electrical machines and the process of energy conversion specifying the type and characteristics of the power source supplying these machines, such as AC or DC, voltage levels, frequency, etc.	L3
CO4	Understand the fundamental principles of semiconductor devices such as diodes and transistors, knowing their roles in switching and amplification.	L1
CO5	Understand the working principles of communication systems, Transducers and fundamentals of IoT.	L1

B. MAPPING MATRIX OF CO,PO, & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	2	-	2	-	-	1	-	-	-	-	-	2	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	1	2	-	-
WT. AVG	2.2	2.6	1	2			1					1	2.2		

C. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time required for the Unit (Hours)
1.	Basic Concepts of Electrical Engineering	08
2.	Alternating Quantities and Electrical Installations	08
3.	Electrical Machines	07
4.	Basic Electronics	08
5.	Communication Systems and IoT	08

A. DETAILED SYLLABUS

Unit	Unit Details
6.	Basic Concepts of Electrical Engineering
	<ul style="list-style-type: none"> • Introduction of Unit • Basic circuit elements and sources; Ohms law; Kirchhoff's laws; Series and Parallel connection of circuit elements; Star-delta transformation; • Mesh current analysis; Node voltage analysis;

	<ul style="list-style-type: none"> • Theorems: Thevenin's, Maximum power transfer and Superposition theorem • Conclusion of Unit
7.	Alternating Quantities and Electrical Installations
	<ul style="list-style-type: none"> • Introduction of Unit • Alternating voltages and currents: RMS, average, maximum values, Single Phase RL, RC, RLC series circuits, Power in AC circuits, Power Factor, • Three phase balanced systems, Star and delta Connections • Electrical Safety, Fuses and Earthing • Conclusion of Unit
8.	Electrical Machines
	<ul style="list-style-type: none"> • Introduction of Unit • Construction, working principle and applications of DC Machines, Transformers, Three phase Induction motors, Synchronous generators, Single phase induction motors. • Special machines -Stepper motor, Universal motor and BLDC motor • Conclusion of Unit
9.	Basic Electronics
	<ul style="list-style-type: none"> • Introduction of Unit • Characteristics: PN junction diode, Zener diode, BJT, MOSFET; Applications: Rectifier, Voltage regulator, Operational amplifier • Digital Electronics: Boolean algebra, Binary System, Logic Gates and Their Truth Tables. • Conclusion of Unit
10.	Communication Systems and IoT
	<ul style="list-style-type: none"> • Introduction of Unit • Basics of Communication: Types of Communication, Amplitude and Frequency Modulation. • Introduction to Transducers, Thermocouple, RTD, Strain Gauges, Load Cell and Bimetallic Strip. • An overview of Internet of Things-Building blocks of IoT, IoT enabling technologies, Characteristics of IoT systems • Conclusion of Unit

RECOMMENDED STUDY MATERIAL

S.No	Reference Book	Author	Edition	Publication
1	Electrical and Electronic Technology	Edward Hughes et al,	Latest	Pearson Publication
2	Basic Electrical & Electronics Engineering	V. Jagathesan, K. Vinod Kumar & R. Saravan Kumar	Latest	Wiley India
3	Basic Electrical & Electronics Engineering	Van Valkenburge	Latest	Cengage learning
4	Basic Electrical and Electronics Engineering by,	Muthusubramaniam	Latest	TMH
5	Basic Electrical & Electronics Engineering	Ravish Singh	Latest	TMH
Important Web Links				
1	https://nptel.ac.in/courses/108108076/			
2	https://nptel.ac.in/courses/117103063/			
3	https://nptel.ac.in/courses/108/101/108101091/			

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Calculating eigen values and eigen vector	L4	PO1, PO5, PO6,
CO2	Determining ordinary differential equation and its types.	L3	PO1, PO2, PO3
CO3	Sketching standard curves using curve tracing.	L3	PO1, PO2, PO3, PO4
CO4	Calculating gamma function and double integration.	L4	PO1, PO2, PO3, PO4,
CO5	Associating Gradient, Divergence and Curl, Directional derivatives	L2	PO1, PO2, PO4

B. Mapping matrix of CO & PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	--	1	1	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	2	3	1	-	-	-	-	-	-	-	-
CO4	3	2	1	1	-	-	-	-	-	-	-	-
CO5	2	1		1	-	-	-	-	-	-	-	-
Wt. AVG	2.8	2	2.3	1	1	1	-	-	-	-	-	-

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	-	-
CO2	3	-	-	-	-
CO3	3	-	-	-	-
CO4	3	-	-	-	-
CO5	3	-	-	-	-
Wt. AVG	3	-	-	-	-

D. 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

E. DETAILED SYLLABUS

Unit	Unit Details
1.	Matrices
	1. Introduction of Unit

	<ol style="list-style-type: none"> 2. Rank of a Matrix, Normal form of a Matrix 3. Consistency of systems of linear equations 4. Eigen Values and Eigen Vectors 5. Cayley-Hamilton Theorem (without proof) 6. Conclusion of Unit
2.	Ordinary Differential Equations
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • Asymptotes • Multiple points • Curve tracing for standard Curves (Cartesian Curves only) • Conclusion & Real life applications
4.	Integral Calculus
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • Scalar and Vector field • Differentiation and Integration of Vector functions • Gradient, Divergence and Curl, Directional derivatives • Conclusion of Unit

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

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Understand the primary manufacturing processes including metal casting, forming, and joining.	L2	PO1, PO2
CO2	Describe the operation and components of internal combustion (IC) engines and evaluate their performance parameters.	L2	PO1, PO2, PO5
CO3	Explain the principles of refrigeration, air conditioning systems, and basics of aerodynamics.	L2	PO1, PO2, PO5
CO4	Understand the architecture, components, and performance factors of electric vehicles.	L2	PO1, PO2, PO5
CO5	Apply ergonomic principles to the design of automotive seats and commercial vehicle cabins.	L3	PO1, PO2, PO3, PO5

B. Mapping matrix of CO & PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-	-
CO3	3	3	-	-	2	-	-	-	-	-	-	-
CO4	3	3	-	-	2	-	-	-	-	-	-	-
CO5	3	3	2	-	2	-	-	-	-	-	-	-
Wt. AVG	3	2.8	2		2							

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO3
CO1	-	-	3
CO2	-	-	3
CO3	-	-	3
CO4	-	-	3
CO5	2	-	3
Wt. AVG	2		3

D. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1	Primary Manufacturing Processes	10
2	IC Engines	7
3	Refrigeration and Air Conditioning and Aerodynamics	9
4	Electric Vehicles	7
5	Ergonomics	7

E. DETAILED SYLLABUS

Unit	Unit Details
1	Primary Manufacturing Processes
	Metal Casting Process: Introduction to Casting Process, Patterns, Molding. Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing. Metal Joining Processes: Introduction to Welding Processes, Gas Welding, Arc Welding, Brazing, and Soldering.
2	IC Engines
	Introduction, Heat Engine, IC engine components and nomenclature; Classification of IC Engines, SI and CI engine operation - two stroke and four stroke engines - construction - working principle; Engine performance parameters, Valve and port timing diagram.
3	Refrigeration and Air Conditioning and Aerodynamics
	Introduction, Clausius statement of second law of thermodynamics, Refrigerator, Heat Pump, COP, Vapour compression refrigeration system (VCRS), Vapour absorption refrigeration system (VARA), Window air-conditioning, Properties and nomenclature of refrigerants. Basics of aerodynamics, Jet propulsion, Turbojet engine.
4	Electric Vehicles
	Architecture of an electric vehicle (EV), Components of an electric car, advantage and limitations EV, Performance Factors of Electric Vehicles, working of traction motor, tractive effort, Traction motor characteristics, transmission requirements, Energy storage – batteries.
5	Ergonomics
	Introduction to Ergonomics, Ergonomics design of automotive driver seat, Commercial vehicle cabin ergonomics, Goods vehicle layout; Design of Work Areas and Stations - Traffic Areas; Human factors in industrial safety; Ergonomic injuries.

RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1	Basics of Mechanical Engineering	Punia	Latest	Dhanpat Rai
2	Basics of Mechanical Engineering	R.K. Rajput	Latest	Laxmi
3	Basics of Mechanical Engineering	DS Kumar	Latest	Kataria
4	IC Engines	V. Ganesan	Latest	Tata McGraw
5	Introduction to Ergonomics	R.S. Bridger	Latest	CRC Press

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Understand the basic Python syntax, including data types, Keywords, Variables, and Identifiers.	L1	PO1,PO2,PO3
CO2	Demonstrate basic operators and understand the concept of Decision making, Conditional Statements and loops for problem solving	L2	PO1,PO2,PO3
CO3	Execute and use the concept of Lists, Tuple, Dictionaries, functions, and different python packages.	L3	PO1,PO2,PO5
CO4	Evaluate various object-oriented programming design principles to create structured python class and objects.	L4	PO1,PO2
CO5	Illustrate and Handle files in python which are raised during the execution of Python scripts	L4	PO1,PO3,PO12

B. Mapping matrix of CO & PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	1	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	-	2	-	-	-	-	-	-	-	-	1
Wt. AVG	2.6	2.5	1.3		1							1

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO 3	PSO4	PSO5
CO1	3	-	-	-	-
CO2	2	-	-	-	-
CO3	1	-	3	-	-
CO4	2	-	-	-	-
CO5	2	1	-	-	-
Wt. AVG	1.8	1	3		

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to Python Programming	7
2.	Python Operators and Control Flow statements	7
3.	Data Structures, Python Functions and Packages	7
4.	Object Oriented Programming	8
5.	File I/O Handling and Exception Handling	7

B. DETAILED SYLLABUS

Unit	Unit Details
1	Introduction to Python Programming
	<ul style="list-style-type: none">• 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. Python building blocks — Identifiers, Keywords, Indention, Variables, Comments• Conclusion of unit
2	Python Operators and Control Flow statements
	<ul style="list-style-type: none">• 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
	<ul style="list-style-type: none">• Introduction to Unit• Lists, Tuple, Sets• String and Slicing• Use of Python built• User defined functions and its types• Using standard packages (math, scipy, Numpy, pandas)• Conclusion of Unit
4	Object Oriented Programming
	<ul style="list-style-type: none">• Introduction of Unit• Creating Classes and Objects• Inheritance• Method Overloading and Overriding• Data Hiding• Types of Methods : Instance Methods , Static Methods , Class Methods• Conclusion of Unit
5	File I/O Handling and Exception Handling
	<ul style="list-style-type: none">• 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

- Regular expressions
- Conclusion of Unit

RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Publication
	Core Python Programming	Chun, JWesley	Pearson,2007
	Head First Python	Barry,Paul	Orielly,2010
	Learning Python	Lutz, Mark	O Rielly, 2009

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course outcomes	On completion of this course, the students will be able:	Bloom Level
CO-1	To perform experiment and determine the wavelength using newton's ring setup & dispersive power of prism for violet, red & yellow color using spectrometer	L4
CO-2	To perform experiment and determine wavelength of prominent lines of mercury by plane diffraction grating using spectrometer	L3
CO-3	To measure the numerical aperture of an optical fiber and the coherent length and coherent time by using He-Ne Laser.	L3
CO-4	Determine the Band Gap of the semiconductor in the form of reverse biased P-N junction diode and determine forward and reverse bias resistance for semiconductor diode.	L5
CO-5	To determine the height of a given line drawn on wall by sextant, determine time constant (both current and voltage graphs are to be plotted)	L5

B. MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	-	-	-	-	-	-	2	2	-	-	3
CO2	3	3	2	-	-	-	-	-	-	-	2	3	-	-	3
CO3	2	3	2	-	-	-	-	-	-	-	2	3	-	-	3
CO4	3	3	1	2	-	-	-	-	-	-	1	3	-	-	3
CO5	3	3	1	-	-	-	-	-	-	-	2	3	-	-	3
Average	3	2.8	1.6	2	-	-	-	-	-	-	1.8	2.8	-	-	3

C. List of Experiment –

1.	To determine the wavelength of Sodium light by Newton's Ring.
2.	To determine the dispersive power of material of a prism for violet, red & yellow colour of Mercury light with the help of spectrometer.
3.	To determine the wavelength of prominent lines of mercury by plane diffraction grating with the help of spectrometer.
4.	To verify the expression for the Resolving Power of Telescope.
5.	To measure the numerical aperture of an optical fiber by He-Ne Laser.
6.	To determine the coherent length and coherent time by using He-Ne Laser.
7.	To study the variation of a semiconductor resistance with temperature and hence determine the Band Gap of the semiconductor in the form of reverse biased P-N junction diode.
8.	To study the characteristics of semiconductor diode and determine forward and reverse bias resistance.
9.	To determine the height of a given line drawn on wall by sextant.

10.	To study Charging and Discharging of a condenser and determine time constant (both current and voltage graphs are to be plotted)
11.	To determine the high resistance by method of leakage, using a Ballistic Galvanometer.
12.	To specify the specific resistance of a material of a given wire by Carey Foster's bridge.

Virtual Lab Practical's and related link

1	To find the resolving power of the prism. <ul style="list-style-type: none"> • https://vlab.amrita.edu/index.php?sub=1&brch=281&sim=1524&cnt=1
2	<ol style="list-style-type: none"> 1. To revise the concept of interference of light waves in general and thin-film interference in particular. 2. To set up and observe Newton's rings. 3. Find the refractive index of given liquid, To determine the wavelength of the given source. https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=1520&cnt=1
3	To calculate the beam divergence and spot size of the given laser beam. https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=342&cnt=1
4	To find the numerical aperture of a given optic fibre and hence to find its acceptance angle. https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1
5	To draw the static current-voltage (I-V) characteristics of a junction diode. https://vlab.amrita.edu/index.php?sub=1&brch=282&sim=1522&cnt=1
6	To construct a zener diode voltage regulator and measure its line and load regulation. https://vlab.amrita.edu/index.php?sub=1&brch=282&sim=1207&cnt=1

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Analyze the strength of NaOH and Na ₂ CO ₃ solutions	L2	PO1, PO2, PO3, PO4, PO6, PO7
CO2	Measure hardness and chloride content of water	L1	PO1, PO2, PO3, PO4, PO6, PO7
CO3	Analyze hardness strength of Ferrous Ammonium sulphate solution and CuSO ₄ solution	L2	PO1, PO2, PO3, PO4, PO6, PO7
CO4	Determine the different properties of lubricating oil	L3	PO1, PO2, PO3, PO4, PO5, PO6, PO7
CO5	Use different instruments & analytical techniques.	L2	PO1, PO2, PO3, PO4, PO6, PO7

B. Mapping matrix of CO, PO & PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	1	1	1	-	1	1	-	-	-	-	-
CO2	2	1	2	1	-	2	2	-	-	-	-	-
CO3	3	2	2	1	-	2	2	-	-	-	-	-
CO4	3	1	2	1	1	2	2	-	-	-	-	-
CO5	2	1	1	1	-	2	2	-	-	-	-	-
Wt. AVG	2.6	1.2	1.6	1	1	1.8	1.8					

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO 3	PSO4	PSO5
CO1	-	-	-	-	1
CO2	-	-	-	-	1
CO3	-	-	-	-	1
CO4	-	-	-	-	1
CO5	-	-	-	-	1
Wt. AVG	-	-	-	-	1

D. LIST OF EXPERIMENTS

1	To determine the strength of NaOH and Na ₂ CO ₃ in a given alkali mixture.
2	To determine the strength of Ferrous Ammonium sulphate solution with the help of K ₂ Cr ₂ O ₇ solution using diphenyl amine as internal indicator.
3	To determine the hardness of water by EDTA method.
4	To determine the amount of chloride content in drinking water
5	To determine the strength of CuSO ₄ solution with the help of hypo solution.
6	To determine the acid value of a given oil.
7	To determine the viscosity of a given lubricating oil by Redwood viscometer.
8	To determine the flash and fire point of a given lubricating oil.
9	To determine the cloud and pour point of a given oil.
10	Synthesis of Bakelite.
11	Determination of pH by pH-metric titration.
12	Estimation of an acid (weak/strong) by Conductometric titration.

RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Publication
1	Engineering Chemistry	Dr. Mahima Tulsian	Jhunjhunuwala Publication
2	Engineering Chemistry Lab Manual	Dr. N. Rama Jyothi	Shine Book publication
3	Chemistry	Dr. Sanjay Sharma	College Book House

Virtual Lab Link: <https://www.vlab.co.in/>

COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Gain concept of functional hierarchical code organization.	L2	PO1, PO2, PO3, PO4, PO6, PO7
CO2	Work with textual information, characters and strings	L1	PO1, PO2, PO3, PO4, PO6, PO7
CO3	Implement file handling concepts	L2	PO1, PO2, PO3, PO4, PO6, PO7
CO4	Implement real time applications using the power of C language features.	L3	PO1, PO2, PO3, PO4, PO5, PO6, PO7
CO5	Overcome and solve possible errors during program execution	L2	PO1, PO2, PO3, PO4, PO6, PO7

B. Mapping matrix of CO, PO & PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
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	-	-	-	-	-
Wt. AVG	2.6	1.8	1.8	2			2					

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO 3	PSO4	PSO5
CO1	3	-	-		
CO2	2	-	-		
CO3	3	-	-		
CO4	2	-	-		
CO5	1	-	-		
Wt. AVG	2.2				

LIST OF EXPERIMENTS

1	a) 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 b) Write a program that reads a floating point number and then displays the right-most digit of the integral part of the number.
2	Program to find largest and smallest number from four given number.
3	Program to find whether a year is leap or not
4	Write a C program in which enter any number by the user and perform the operation of Sum of digits of entered number.
5	Write a C Program to convert Decimal number to Binary number
6	Find the sum of this series upto n terms 1+2+3+4+5+6+.....
7	Program to print Armstrong's numbers from 1 to 100.
8	Write a program to convert years into Minute, Hours, Days, Months, Seconds using switch () statements
9	Write a C menu driven program
10	Write a program to generate the various pattern of numbers
11	a) Write a C Program to print the reverse of an integer number b) Write a C program to perform Matrix addition and multiplication operations.
12	a) Write a C program to perform the factorial of given number. b) Write a program to determine the length of the string and find its equivalent ASCII codes.
Virtual Lab	
1	1. Click on the square to define a function for calculating the area of a square. 2. Similarly define functions for the other geometrical figures 3. The defined functions are shown in the middle window 4. Now do appropriate function calls in the main program to compute the area of the figure displayed 5. Press execute to execute the code and see the output
2	1. To understand the concept of memory address associated with every variable. 2. To understand pointer referencing and dereferencing. 3. To understand how pointers are useful in dynamic allocation of memory.
3	1. To understand that some problems can be broken down into smaller similar problems. 2. To solve such problems using recursive procedures.

A. 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://cse02-iiith.vlabs.ac.in/List%20of%20experiments.html			
	https://www.w3resource.com/c-programming-exercises			

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COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Understand basic functions of commands, their techniques and fundamentals used in drafting and drawing.	L2	PO1,PO2
CO2	Demonstrate the fundamentals of commands through line diagram.	L2	PO1,PO2, PO3
CO3	Compare various shortcut keys and their different use case in drafting.	L4	PO1,PO2,PO3,P O4,PO5,PO6,PO 7,PO9
CO4	Understand the fundamental principles of Blocks, Hatching, and texts of drawings.	L2	PO1,PO2,PO3,P O4,PO5,PO6,PO 7,PO8,PO9,PO1 0,PO11,PO12
CO5	Creating the layout of 2D plans in the workspace.	L6	PO1,PO2,PO3,P O4,PO5,PO6,PO 7,PO8,PO9,PO1 0,PO11,PO12

B. Mapping matrix of CO, PO & PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	1	1	1	3	1	2	-	1	-	-	-
CO4	3	3	2	3	3	2	2	2	2	1	1	1
CO5	3	3	3	3	3	3	3	3	2	2	2	2
Wt. AVG	3	2	2	2.3	3	2	2.3	2.5	1.6	1.5	1.5	1.5

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO 3	PSO4	PSO5
CO1	1	-	-	-	-
CO2	1	-	-	-	-
CO3	1	-	-	-	-
CO4	1	-	-	-	-
CO5	1	-	-	-	-
Wt. AVG	1	-	-	-	-

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 Stretch 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	2D Plan of 1 BHK Residential Structure
10	2D Pine Flat Dam
11	2D Sewerage Treatment Plant of Poornima University
12	Line Diagram of T shaped Building
Virtual Lab	
1	https://www.autodesk.in/campaigns/autocad-tutorials
2	https://web.autocad.com/login

COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Assemble and understand the operation of house wiring systems	L1	PO1, PO2,
CO2	Gain the ability to prepare and test connections for single-phase and three-phase induction motors using auto transformers	L2	PO1, PO2, PO3,
CO3	Develop the skills to connect and measure the electrical parameters (voltage, current, and power) of various lighting systems, such as fluorescent lamps, sodium vapor lamps, and halogen lamps.	L3	PO1, PO2, PO3
CO4	Proficient in identifying, testing, and applying various electronic components, such as resistors, conductors, capacitors, diodes, LEDs, LCDs, BJTs,	L2	PO1, PO2, PO3
CO5	Verify the truth tables of basic logic gates (AND, OR, NOT, NOR, NAND) and understand their applications.	L2	PO1, PO2, PO4

B. Mapping matrix of CO, PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-								
CO2	3	2	3	-								
CO3	3	2	3	-								
CO4	3	3	2	-								
CO5	3	2	2	2								
Wt. AVG	3	2.4	2.4	2								

LIST OF EXPERIMENTS

1	Assemble house wiring including earthing for 1-phase energy meter, MCB, ceiling fan, tube light, three pin socket and a lamp operated from two different positions. Basic functional study of components used in house wiring.
2	Prepare the connection of ceiling fan along with the regulator and vary the speed.
3	Prepare the connection of single phase induction motor through 1-Phase Auto-transformer and vary the speed.
4	Prepare the connection of three phase squirrel cage induction motor through 3-Phase Autotransformer and vary the speed.
5	Prepare the connection of Fluorescent Lamp, Sodium Vapour and Halogen Lamp and measure voltage, current and power in the circuit.
6	Identification, testing and application of Resistors, Inductors, Capacitors, PN-Diode. Zenger Diode, LED, LCD, BJT, Photo Diode, Photo Transistor, Analog/Digital Multi- Metres and Function/Signal Generator.
7	Measure the frequency, voltage, current with the help of CRO.

8	Assemble the single phase half wave and full wave bridge rectifier & the analyse effect of L, C and L-C filters in rectifiers.
9	Verify the truth table of AND, OR, NOT, NOR and NAND gates
10	Introduction to IOT. Printing of a Hello World on LCD Screen using Arduino
11	Controlling the Light Emitting Diode (LED) with a push button and Interfacing of the Relay with Arduino.
12	Introduction to Raspberry Pi and Programming of available GPIO pins of the corresponding device using native programming language. Interfacing of I/O devices like LED/Switch etc., and testing the functionality.
Virtual Lab	
1	To perform Ohm's Law http://vlabs.iitkgp.ernet.in/be/exp4/index.html
2	Half Wave Rectification http://vlabs.iitkgp.ernet.in/be/exp6/index.html
3	VI Characteristics of Diode http://vlabs.iitkgp.ernet.in/be/exp5/index.html

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

COURSE OUTCOMES (Cos)	At the end of this course, learner will be able to :	Bloom Level	PO Mapping
CO – 01	Prepare a model of T Lap and T- Bridle Joint through carpentry shop	L3	PO1, PO2, PO3
CO – 02	Understand the making of prototype model through foundry shop	L2	PO1,PO2,PO3
CO – 03	Understand the difference between gas welding and arc welding and their applications.	L2	PO1, PO2, PO3
CO – 04	prepare a model on fitting shop through filling, drilling and tapping operation	L3	PO1, PO2,PO3
CO – 05	Understand the difference between forging, moulding and casting	L2	PO1, PO2, PO3

B. MAPPING MATRIX OF CO, PO, & PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	1	-	-	-	-	-	-	-	-	-
CO 2	3	1	2	-	-	-	-	-	-	-	-	-
CO 3	3	2	1	-	-	-	-	-	-	-	-	-
CO 4	3	2	1	-	-	-	-	-	-	-	-	-
CO 5	3	2	1	-	-	-	-	-	-	-	-	-
WT. AVG	3	1.8	1.2									

C. DETAILED SYLLABUS

1	Carpentry Shop <ul style="list-style-type: none"> Timber, definition, engineering applications, seasoning and preservation Plywood and ply boards
2	Foundry Shop <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> Files, materials and classification.
5	Smithy Shop <ul style="list-style-type: none"> Forging, forging principle, materials Operations like drawing, upsetting, bending and forge welding Use of forged parts

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

COURSE OUTCOMES (Cos)	At the end of this course, learner will be able to :	Bloom Level	PO Mapping
CO – 01	Understand basic technical drawing concepts, including lines, lettering, dimensions, and scales, through the creation of sketches and drawings.	L2	PO2, PO4, PO5
CO – 02	Construct conic sections (ellipse, parabola, and hyperbola) on drawing sheets, showcasing practical application skills.	L3	PO4, PO5,
CO – 03	Apply knowledge of projection techniques to represent complex objects, such as regular polygons in different positions.	L3	PO1, PO3, PO4, PO5
CO – 04	Differentiate between types of projections, such as orthographic projections with first and third angle conventions. Proficiently project points, straight lines, and planes in different positions	L3	PO1, PO4
CO – 05	Analyze knowledge of sectional views and machine drawing techniques to communicate design and manufacturing details effectively	L3	PO1, PO4

B. MAPPING MATRIX OF CO, PO, & PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	-	2	-	2	2	—	—	—	—	—	—	—
CO 2	-	-	-	3	2	—	—	—	—	—	—	—
CO 3	3	-	2	2	2	—	—	—	—	—	—	—
CO 4	3	-	-	2	-	—	—	—	—	—	—	—
CO 5	3	-	-	3	-	—	—	—	—	—	—	—
WT. AVG	3	2	2	2.5	2							

C. List of Experiments

1.	<ul style="list-style-type: none"> • Lines, Lettering and Dimension (Sketch Book) • Scales: Representative Fraction, plain scales, diagonal scales, (In drawing sheet 1)
2.	<ul style="list-style-type: none"> • Conic Sections: Construction of ellipse, parabola and hyperbola by different methods(in drawing sheet 2)
3.	<ul style="list-style-type: none"> • 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 (four problems in drawing sheet 3)
4.	<ul style="list-style-type: none"> • Orthographic Projections (3 Problems in drawing sheet 4)
5.	<ul style="list-style-type: none"> • Sectional Views (2 Problems) and Riveted joints, lap joints, butt joints, (drawing sheet 5)

RECOMMENDED STUDY MATERIAL

Sr.No	Reference Book	Author	Edition	Publication
1	Engineering Drawing	N. D. Bhatt	Latest	Charotar Publishing House PVT. LTD.
Virtual Lab				
1	https://kdm-iitkgp.vlabs.ac.in/exp/simple-drawing-board/theory.html			
2	https://cse18-iiith.vlabs.ac.in/			

COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Understand why Python is a useful scripting language for developers.	L2	PO1, PO2, PO3
CO2	Develop problem solving and critical thinking skills in fundamental enable techniques like conditionals and loops.	L3	PO1, PO2, PO3
CO3	Execute python program with concept of functions, List, Dictionary, structure, class & object.	L3	PO1, PO2, PO4
CO4	Integrate the key issues in Python code, develop and experiment with python programming.	L4	PO1, PO2, PO5
CO5	Linking read and write data from/to files in Python and Develop Python programs step-wise by defining functions with turtle.	L4	PO1, PO3, PO5

B. Mapping matrix of CO, PO & PSO

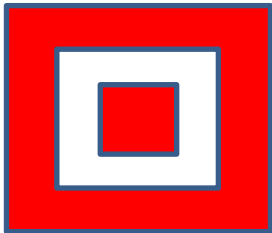
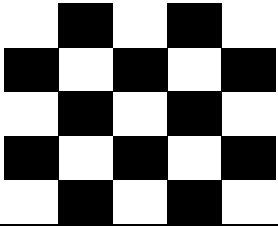
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-
CO3	2	3	-	1	-	-	-	-	-	-	-	-
CO4	3	2	-	-	1	-	-	-	-	-	-	-
CO5	3	-	2	-	1	-	-	-	-	-	-	-
Wt. AVG	2.6	2.5	1	1	1							

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO 3	PSO4	PSO5
CO1	3	-	-	-	-
CO2	2	-	-	-	-
CO3	2	-	3	-	-
CO4	2	-	-	-	-
CO5	1	-	-	-	3
Wt. AVG	2		3		3

LIST OF EXPERIMENTS

1	a) Write a python program to check if the number is prime or not. b) Write a python program to find greatest of four numbers entered by user.
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2	Write and run a Python program that asks the user for a temperature in Celsius and converts and output the temperature in Fahrenheit.
3	Write python program to perform following operations on Lists: a) Create list b) Access list c) Update list (Add item, Remove item) d) Delete list
4	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.
5	Modify the program above using a while loop so it prints out all of the factorial values that are less than 1 billion.
6	Write a python program to find the minimum in the array and find its index in the array.
7	Write a python program to implement bubble sort using function.
8	Write a python program to read 3 subject marks and display pass or failed using class and object.
9	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. 
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. 
Virtual Lab	
1	Simulate python program to perform all Arithmetic Operations.
2	Simulate python program to analyze the concept of Constructor and Inheritance.
3	Simulate python program using Math, datetime, random and operator Module.

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

COURSE OUTCOMES (Cos)	At the end of this course, learner will be able to :	Bloom Level	PO Mapping
CO – 01	Predict a problem of current relevance to society using research and analytical skills.	L2	PO1, PO2, PO3, PO6, PO7, PO9, PO10, PO12
CO – 02	Formulate the problem and identify suitable modeling paradigms through collaborative discussions and research.	L3	PO1,PO2,PO3, PO4, PO6, PO7, PO9, PO10, PO11, PO12
CO – 03	Categorize the problem and identify the solution methodology using systematic problem-solving techniques.	L3	PO1, PO2, PO3, PO4, PO6, PO7, PO9, PO10, PO11, PO12
CO – 04	Simulate and design systems using various modern tools and software applications.	L4	PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO9, PO10, PO11, PO12
CO – 05	Validate the results and prepare a comprehensive project report.	L4	PO1, PO2,PO3, PO4, PO5, PO6, PO7, PO9, PO10, PO11, PO12

MAPPING MATRIX OF CO, PO, & PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	1	-	-	2	1	-	1	1	-	2
CO 2	3	3	3	2	-	2	2	-	2	2	1	2
CO 3	3	3	2	2	-	2	2	-	2	2	1	2
CO 4	3	3	3	2	3	2	2	-	3	3	2	3
CO 5	3	3	3	3	3	2	2	-	3	3	2	3
WT. AVG	3	3	2.4	2.25	3	2	1.8	-	2.2	2.2	1.5	2.4

GUIDELINES:

- The Project group must complete project in all respect (assembly, testing, fabrication, tabulation, test result etc.)
- 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.
- The guides should regularly monitor the progress of the project work.
- 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.
- Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
- Assessment of the project forward of marks shall be done by the guide and a departmental committee.
- The guide should be internal examiner for oral examination.
- 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.

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Introduction to scope of environmental studies & concept of ecology, ecosystem and biodiversity.	L2	PO7, PO8, PO12,
CO2	Implement innovative ideas of controlling different categories of Environmental Pollution.	L3	PO7, PO8, PO11, PO12,
CO3	Environmental issues & various Environmental Acts, regulations and International Agreements.	L2	PO7, PO8, PO11, PO12,
CO4	Social issues related to population, resettlement and rehabilitation of project affected persons. Demonstrate disaster management w.r.t floods, earthquakes, cyclones and landslides.	L2	PO7, PO8, PO11, PO12,
CO5	Determination of local environmental assets with simple ecosystems and identify local flora and fauna	L4	PO7, PO8, PO11, PO12,

B. Mapping matrix of CO & PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	—	—	—	—	—	—	2	2	—	—	—	1
CO2	—	—	—	—	—	—	3	2	—	—	1	1
CO3	—	—	—	—	—	—	2	3	—	—	1	1
CO4	—	—	—	—	—	—	3	2	—	—	1	1
CO5	—	—	—	—	—	—	2	3	—	—	1	1
Wt. AVG							2.4	2.4			1	1

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO 3	PSO4	PSO5
CO1	—	—	1	—	—
CO2	—	1	1	—	—
CO3	—	1	1	—	—
CO4	—	1	1	—	—
CO5	—	1	1	—	—
Wt. AVG		1	1		—

D. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to Environmental Studies	5
2.	Environmental Pollution and its Control	5
3.	Environmental Policies & Practices	5
4.	Human Communities and the Environment	5
5.	Field Work	4

E. DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction to Environmental studies
	<ul style="list-style-type: none"> • Introduction of Unit • Multidisciplinary nature of environmental studies Concept of sustainability and sustainable development. • Ecosystem: Structure and function of ecosystem • Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies\ • Case studies of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem • Aquatic ecosystems • Biodiversity and Conservation • Conclusion of the Unit
2.	Environmental Pollution and its Control
	<ul style="list-style-type: none"> • Introduction of Unit • Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution • Nuclear hazards and human health risks • Solid waste management: Control measures of urban and industrial waste. • Pollution case studies • Conclusion of the Unit
3.	Environmental Policies & Practices
	<ul style="list-style-type: none"> • Introduction of Unit • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies. • Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. • International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD) • Conclusion of the Unit
4.	Human Communities and the Environment
	<ul style="list-style-type: none"> • Introduction of Unit • Human population growth: Impacts on environment, human health and welfare. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management: floods, earthquake, cyclones and landslides. • Conclusion of the Unit
5.	Field Work
	<ul style="list-style-type: none"> • Introduction of Unit

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, Delhi Ridge, etc.
- Conclusion of the Unit

RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Edition	Publication
1	Environmental Studies	ErachBarucha	Latest	UGC
2	Environmental Studies	Benny Joseph	Latest	Tata McGrawHill
3	Environmental Studies	R. Rajagopalan	Latest	Oxford University Press
4	Principles of Environmental Science and Engineering	P. Venugoplan Rao	Latest	Prentice Hall of India.
5	Environmental Science and Engineering	Meenakshi	Latest	Prentice Hall India.

COURSE OUTCOMES:

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Practice the fundamental concepts of grammar, including parts of speech, sentence structures, and tenses.	Apply
CO2	Compute common grammatical errors using the rules and principles learned in the course.	Apply
CO3	Construct a robust vocabulary through various exercises for effective sentence formation.	Apply
CO4	Use the principles of effective writing in well-structured paragraphs, articles, and formal and informal letters	Apply
CO5	Examine texts at both beginner and intermediate levels, and effectively answer questions based on the readings, preparing them for competitive exams.	Analyse

A. OUTLINE OF THE COURSE

Unit No.	Title of the Unit	Time Required for the Unit (Hours)
1.	Basics of Grammar	8
2.	Spotting the Grammatical Errors and Rectification	2
3.	Vocabulary Building	4
4.	Basics of Writing Skills	2
5.	Reading Comprehension	8

B. DETAILED SYLLABUS

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

C. RECOMMENDED STUDY MATERIAL

Sr.No	ReferenceBook	Author	Edition	Publication
1.	English Literature	Benjamin W. Griffith	1882	Stuart Langton
2.	English Literature: Its History and Significance	William J.Long	2012	Maple Press2
3.	English Grammar and Composition	Wren & Martin	2017	S.Chand Publishing

COURSE OUTCOMES:

Course Outcome	At the end of this course, learners will be able to:	Bloom Level
CO1	Identify common errors in spoken and written communication.	Understand
CO2	Employ day-to-day English vocabulary and language proficiency skills.	Apply
CO3	Use sensible official writing and documenting skills.	Apply
CO4	Measure their personal and Technical Communication Skills	Evaluate
CO5	Produce an efficient way of expression in professional and personal spaces.	Apply

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Everyday Conversations	8
2.	Asking for	7
3.	Reporting/ Describing	7
4.	Meeting People	7
5.	Expressing & Talking about	7

B. DETAILED SYLLABUS

Unit	Contents
1.	Everyday Conversations
	<ul style="list-style-type: none"> ● Introduction to the Unit ● Introducing self / others ● Weather ● Classroom ● Asking about facilities around ● Describing a person / thing ● Points to cover: Vocabulary, grammar, Construction of sentences, listening ● Methodology: Role plays, Videos, Classroom conversation, worksheets ● Conclusion & Real Life Application
2.	Asking for
	<ul style="list-style-type: none"> ● Introduction to the Unit ● Help/ Suggestion/ ideas ● Clarification/ Directions ● Time/ food ● Advice ● Uses ● Points to cover: Vocabulary, grammar, Construction of sentences, listening ● Methodology: Role plays, Videos, Classroom conversation, worksheets ● Conclusion & Real-Life Application
3.	Reporting/ Describing
	<ul style="list-style-type: none"> ● Introduction to the Unit ● Incidences ● Personalities ● Experiences

	<ul style="list-style-type: none"> ● Wants/Needs ● Intentions ● Points to cover: Vocabulary, grammar, Construction of sentences, listening ● Methodology: Role plays, Videos, Classroom conversation, worksheets ● Conclusion & Real-Life Application
4.	Meeting People
	<ul style="list-style-type: none"> ● Introduction to the Unit ● Greetings ● Starting the Conversation ● Small talks ● Closing the conversation ● Points to cover: Vocabulary, Grammar, Construction of sentences, listening ● Methodology: Role plays, Videos, Classroom conversation, worksheet ● Conclusion & Real-Life Application
5.	Expressing & Talking about
	<ul style="list-style-type: none"> ● Introduction to the Unit ● Happiness/Displeasure ● Preferences ● Doubts ● Views ● Unawareness ● Points to cover: Vocabulary, grammar, Construction of sentences, listening ● Methodology: Role plays, Videos, Classroom conversation, worksheets Interests ● Different Cultures, Clothes, cars, institutes, situations ● Schedules, prices ● Points to cover: Vocabulary, grammar, Construction of sentences, listening Methodology: Role plays, Videos, Classroom conversation, worksheets ● Conclusion & Real-Life Application

COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Remember how to identify systems with Artificial Intelligence. Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.	L1	PO2, PO3, PO4, PO12
CO2	Apply appropriate search strategies to solve AI problems. Evaluate the efficiency and effectiveness of different search algorithms.	L3, L5	PO2, PO3, PO4, PO5
CO3	Understand the fundamentals of Constraint Satisfaction Problems (CSP). Explain the importance and applications of CSPs in AI.	L2	PO2, PO3, PO4, PO5
CO4	Analyze adversarial search in game playing and find out optimal solution using different algorithms. Analyzing Different types of games.	L4	PO2, PO3, PO4, PO5
CO5	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, Speech recognition and other machine learning models.	L2	PO2, PO3, PO4, PO12

Mapping matrix of CO & PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	-	1	2	1	-	-	-	-	-	-	-	3
CO2	-	2	3	2	3	-	-	-	-	-	-	-
CO3	-	2	3	2	3	-	-	-	-	-	-	-
CO4	-	1	3	2	3	-	-	-	-	-	-	-
CO5	-	2	2	1	-	-	-	-	-	-	-	3
Wt. AV G		1.6	2.6	1.6	1.8							1.

Mapping matrix of CO & PSO

	PSO1	PSO2	PSO 3	PSO4	PSO5
CO1	-	-	-	-	3
CO2	-	-	-	-	3
CO3	-	-	-	-	3
CO4	-	-	-	-	3
CO5	-	-	-	-	3
Wt. AVG					3

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to Artificial Intelligence	7
2.	Problem solving by Search	8
3.	Constraint Satisfaction Problems	7
4.	Adversarial Search and Game Playing	7
5.	AI Applications	7

B. DETAILED SYLLABUS

Unit	Unit Details
1	Introduction to Artificial Intelligence
	<ul style="list-style-type: none">● 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
	<ul style="list-style-type: none">● 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, A* search, Hill-climbing search, and Genetic algorithms● Conclusion of the Unit
3	Constraint Satisfaction Problems
	<ul style="list-style-type: none">● 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
	<ul style="list-style-type: none">● 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

	<ul style="list-style-type: none"> ● 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
	<ul style="list-style-type: none"> ● 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

RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Publication
1.	Artificial Intelligence: A Modern Approach	S. Russell and P. Norvig	Prentice Hall
2.	Artificial Intelligence: A Systems Approach (Computer Science),	M. Tim Jones	Jones and Bartlett Publishers
3.	Prolog: Programming for Artificial Intelligence	I. Bratko	Addison-Wesley Educational Publishers Inc

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Understand the fundamental concepts of cyber security and its significance in the modern digital world.	L2	PO1, PO2, PO8
CO2	Identify and analyze various types of cyber threats and vulnerabilities.	L1	PO1, PO2, PO3, PO4, PO5, PO9
CO3	Implement cryptographic techniques to secure data and communications.	L2	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Develop strategies to secure networks and applications against cyber-attacks.	L3	PO1, PO2, PO3, PO4, PO5 PO6, PO7
CO5	Conduct ethical hacking and penetration testing to assess system security.	L2	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8

B. Mapping matrix of CO & PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	1	-	-	-	-
CO2	3	3	2	2	1	-	-	-	1	-	-	-
CO3	3	3	2	2	1	1	-	-	-	-	-	-
CO4	3	3	3	3	2	1	1	-	-	-	-	-
CO5	3	3	3	2	2	1	1	1	-	-	-	-
Wt. AVG	3	2.8	2	2	1.2	0.6	0.4	0.4	0.2	-	-	-

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	-	-	-	2
CO2	3	3	2	1	-
CO3	3	2	2	-	-
CO4	2	2	3	-	2
CO5	1	1	-	3	-
Wt. AVG	2.4	1.6	1.4	0.8	0.8

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction to Cyber Security	7
2.	Cryptography in Cyber Security	7
3.	Network Security Fundamentals	7
4.	Application Security	8
5.	Security Policies	7

B. DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction to Cyber Security
	<ul style="list-style-type: none"> ● Introduction of Unit ● Overview of Cyber Security ● Importance and Challenges ● History of Cyber Security ● Cyber Threats and Attack Vectors ● Types of Cyber Threats ● Attack Vectors ● Conclusion of Unit
2.	Cryptography in Cyber Security
	<ul style="list-style-type: none"> ● Introduction to Cryptography ● Symmetric and Asymmetric Encryption ● Hash Functions ● Advanced Cryptographic Techniques ● Public Key Infrastructure (PKI) ● Digital Signatures ● Cryptographic Protocols ● Conclusion of Unit
3.	Network Security Fundamentals
	<ul style="list-style-type: none"> ● Introduction of the Unit ● Network Security Principles ● Firewalls and Intrusion Detection Systems (IDS) ● Virtual Private Networks (VPNs) ● Securing Network Infrastructures ● Network Segmentation ● Secure Network Design ● Wireless Network Security ● Conclusion of Unit
4.	Application Security
	<ul style="list-style-type: none"> ● Introduction of the Unit ● Secure Software Development ● Web Application Security ● Common Vulnerabilities and Exposures (CVEs) ● Ethical Hacking and Penetration Testing ● Ethical Hacking Principles ● Penetration Testing Methodologies ● Tools and Techniques ● Malware Analysis ● Types of Malwares ● Analysis Techniques ● Conclusion of Unit
5.	Security Policies
	<ul style="list-style-type: none"> ● Introduction of the Unit ● Security Policies and Governance ● Cyber Security Policies ● Compliance and Regulations ● Risk Management ● Emerging Trends in Cyber Security ● Internet of Things (IoT) Security ● Cloud Security ● Artificial Intelligence in Cyber Security ● Conclusion of Unit

RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Publication
1	INTRODUCTION TO CYBER SECURITY	Cma Maithili Malpure, Madhu, Dr Pratap Patil, Niraj Kumar Rai, Dr Kritika Gosa	Redshine Publication
2	Cybersecurity Fundamentals	Rajesh Kumar Goutam	BPB Publisher
3	Mastering Your Introduction to Cyber Security	Dr. Michael C. Redmond PHD	BookLocker Inc

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Have a thorough understanding of the fundamental concepts and techniques used in digital electronics and To understand and examine the structure of various number systems and its application in digital design.	L2	PO1, PO2, PO3, PO4, PO6, PO7
CO2	Learn the minimization techniques to simply the hardware requirements of digital circuits, implement it, design and apply for real time digital systems.	L4	PO1, PO2, PO3, PO4, PO6, PO7
CO3	Understand the working mechanism and design guidelines of different combinational, sequential circuits and their role in the digital system design.	L3	PO1, PO2, PO3, PO4, PO5, PO6, PO11,PO12
CO4	Ability to identify basic requirements for a design application and propose a cost effective solution.	L4	PO1, PO2, PO3,PO4,PO 5,PO6, PO11,PO12
CO5	Became able to know various types of components-ADC and DAC, memory elements and the timing circuits to generate different waveforms.	L2	PO1, PO2, PO3, PO4, PO5, PO6, PO11,PO12

B. Mapping matrix of CO & PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	2	1	2								
CO2	3	2	1	2	2	2					1	1
CO3	3	2	1	2	2	2					1	1
CO4	3	2	1	2	2	2					2	2
CO5	2	-	1	2	2	2					2	2
Wt. AV G	3	1.6	1	2	1.6	1.6					1.2	1.2

C. Mapping matrix of CO & PSO

	PSO1	PSO2	PSO 3	PSO4	PSO5
CO1	2				
CO2	2	2			
CO3	2	2			
CO4	2	2	2		
CO5	2	2	2		
Wt. AVG	2	1.6	0.8		

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.	<p>Number System and Logic Gates</p> <ul style="list-style-type: none"> • 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 – De-Morgan's Theorems — 1's complement – 2's complement – Adders (half & full) – Subtractor (half & full). • Conclusion of the Unit
2.	<p>Decoders, Multiplexers & De-Multiplexers</p> <ul style="list-style-type: none"> • 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.	<p>Flip-Flops</p> <ul style="list-style-type: none"> • 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.	<p>Registers And Counters</p> <ul style="list-style-type: none"> • 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 • Ring counter with timing diagram • Conclusion of the Unit
5.	<p>Memories And Converters</p> <ul style="list-style-type: none"> • 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

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

1.	Digital Electronics by Rajaraman V., Prentice Hall of India, New Delhi			
2.	Digital Electronics and Applications by Malvino Leach, Tata McGraw Hill Education Pvt Ltd, New Delhi			

Online Resources

1.	https://archive.nptel.ac.in/courses/108/105/108105132/			
2.	https://onlinecourses.nptel.ac.in/noc22_ee55/preview			

A. COURSE OUTCOMES AND THEIR RESPECTIVE MAPPING

Course Outcomes (COs)	At the end of this course, learners will able to:	Bloom level	PO Mapping
CO1	Understand core concepts of cloud computing and different types of cloud architectures (public, private, hybrid). Explore principles and architectures of cloud technology and Evaluate cloud solutions from different providers	Understand	PO1, PO2, PO3, PO4, PO5
CO2	Understand the basic concepts and importance of migrating to the cloud. Identify and apply effective steps for migrating to the cloud. Learn methodologies to mitigate risks and address company concerns during cloud migration. Review and analyze real-world case studies of cloud migration to understand best practices and lessons learned.	Understand	PO1, PO2, PO3, PO4, PO7
CO3	Analyze skills in selecting scalable applications that align with organizational needs and goals. Understand best practices for selecting cloud services and providers Explore issues for selecting cloud services and providers Analyze commercial and business considerations relevant to cloud cost management and provider selection.	Analyze	PO1, PO2, PO3, PO4, PO5
CO4	Demonstrate governance principles in cloud computing. Learn about industry standards organizations and groups associated with cloud computing. Understand the importance of IT governance in cloud computing and its implications. Explore cloud governance Examine legal issues Analyze legal considerations in commercial and business contexts.	Demonstrate	PO1, PO2, PO3, PO4, , PO7
CO5	Implement robust service management practices to ensure the smooth operation of cloud services. Initiate cloud adoption with a pilot project to test capabilities and assess feasibility before full-scale deployment.	Apply	PO1, PO2, PO3, PO4, PO7

B. Mapping matrix of CO & PO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
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					
Wt. AV G	2	1	1	2	2		2					

C. Mapping matrix of CO & PSO2

	PSO1	PSO2	PSO 3	PSO4	PSO5

CO1	3				
CO2	1				
CO3	3				
CO4	2				
CO5	2				
Wt. AVG	2				

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Introduction	7
2.	Cloud Computing Companies and Migrating to Cloud	7
3.	Cloud Cost Management and Selection of Cloud Provider	7
4.	Governance in the Cloud	8
5.	Ten cloud do's and do not's	7

B. DETAILED SYLLABUS

Unit	Unit Details
1	Introduction
	<ul style="list-style-type: none"> • 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, • Conclusion of the Unit
2	Cloud Computing Companies and Migrating to Cloud
	<ul style="list-style-type: none"> • Introduction to Unit, • 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
	<ul style="list-style-type: none"> • 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. • Understanding Best Practices used in selection of Cloud service and providers, • Clouding the Standards and Best Practices Issue: Interoperability, Portability, Integration, Security, • Commercial and Business Consideration • Conclusion of the Unit
4	Governance in the Cloud
	<ul style="list-style-type: none"> • Introduction to Unit • Industry Standards Organizations and Groups associated with Cloud Computing, • Need for IT governance in cloud computing

	<ul style="list-style-type: none"> ● 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
	<ul style="list-style-type: none"> ● 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

RECOMMENDED STUDY MATERIAL:

S. No	Reference Book	Author	Publication
1	Cloud Computing: Principles and Paradigms	Rajkumar Buyya, James Broberg, Andrzej M. Goscinski	John Wiley and Sons Publications, 2011
2	Cloud Computing Theory and Practice	Dan C Marinescu, Elsevier	2013
3	Cloud Computing for Dummies	Judith Hurwitz, Robin Bloor, Marcia Kaufman & Fern Halper	Wiley Publishing, 2010

COURSE OUTCOME

COURSE OUTCOMES (Cos)	At the end of this course, learner will be able to :	Bloom Level	PO Mapping
CO – 01	Understand fundamental mechanics laws and principles to analyse systems of forces and moments accurately.	L2	PO1, PO2
CO – 02	Apply concepts of machine design and moment of inertia to optimize lifting machines and understand their mechanical behaviour.	L3	PO1, PO2, PO3, PO4
CO – 03	Analyse frictional effects in mechanical systems and optimize power transmission efficiency using belt drive principles.	L4	PO1, PO2, PO3, PO4
CO – 04	Evaluate particle and rigid body dynamics using kinematic and kinetic principles to predict system behaviour accurately.	L5	PO1, PO2, PO4
CO – 05	Evaluate work, power, and impact in mechanical systems, analysing collision impacts effectively using principles of energy conservation.	L5	PO1, PO2, PO4

MAPPING MATRIX OF CO, PO, & PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	3	-	-	-	-	-	-	-	-	-	-
CO 2	3	3	3	2	-	-	-	-	-	-	-	-
CO 3	2	3	3	3	-	-	-	-	-	-	-	-
CO 4	2	3	-	3	-	-	-	-	-	-	-	-
CO 5	2	3	-	3	-	-	-	-	-	-	-	-
WT. AVG	2.2	3	3	2.75								

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
	<ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> • 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. • 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 and L. • Conclusion of Unit
3.	Friction & Belt Drive
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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

POORNIMA UNIVERSITY, JAIPUR

Faculty of Engineering and Technology

**Name of Program: B.Tech. in Electrical and Computer Engineering
Total Credits: 171**

Duration: 4 Years

Teaching Scheme for Batch 2024-28

Semester-III

Course Code	Name of Course	Teaching Scheme			SH	Marks			Cr ed its
		Lecture (L)	Tutorial (T)	Practical (P)		IE	ESE	Total	
A.		Major (Core Courses)							
A.1	Theory								
BERCSA3101	Engineering Mathematics - II	3	0	0		40	60	100	3
BERCEE3102	Electrical Machines	3	0	0		40	60	100	3
BERCEE3103	Electronic Measurement and Instrumentation	3	0	0		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		60	40	100	1
BERCCE3205	JAVA LAB	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		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)							
BUACHM3209	Professional Skills-I	0	0	2		40	60	100	1
E		Skill Enhancement Courses (SEC)							
BULCSE3201	Skill Enhancement Generic Course-III	0	0	2		60	40	100	1
F		Value Added Courses (VAC)							
BUVCVE3104	Green Built Environment	2	0	0		40	60	100	2
G		Summer Internship / Research Project / Dissertation							
	-	16		14					23
Total Teaching Hours		30/30							

COURSE OUTCOMES: 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
- Evaluate solution of singular series by Taylor's and Laurent's series. Application based studies for
- CO5** 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> • Introduction of Unit • Z-transforms, its inverse, simple properties and application to difference equations. • Conclusion and Summary of Unit
4.	Complex Variables-I
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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 and Agarwal	Latest	Aashirwad Publication
3.	Higher Engineering Mathematics	B V Ramannath	Latest	TMH
4.	Higher Engineering Mathematics	B S Grewal	Latest	---
Websites				
<ul style="list-style-type: none"> • 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

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

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
- CO2** 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 construction, working principle, Torque-slip characteristics and speed control method.
Rewrite the operation of Capacitor start capacitor run, motors, Shaded pole motor, Repulsion type
- CO5** 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
	<ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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,IJ	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

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 THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	Philosophy of measurement & Analog measurement of Electrical Quantities
	<ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
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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

COURSE OUTCOMES: 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 THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	Electronics Devices
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • Transistors Amplifier: Small Signal BJT amplifiers: AC equivalent circuit, hybrid, re model and their use in amplifier design. Multistage amplifiers, frequency response of basic & compound configuration, Power amplifiers: Class A, B, AB, C and D stages, IC output stages. • Operational Amplifiers: Op-Amp Basics, practical Op-

	<p>Mode operation, Inverting & Non Inverting Amplifier, differential and cascade amplifier, Op-Amp applications.</p> <ul style="list-style-type: none"> • Conclusion and Summary of Unit □
3.	Feedback and oscillator Circuits
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • Number Systems: Decimal, binary, octal, hexadecimal number system and conversion, binary weighted codes, signed numbers, 1s and 2s complement codes, Binary arithmetic • Boolean Algebra: Binary logic functions, Boolean laws, truth tables, associative and distributive properties, De-Morgan's theorems, realization of switching functions using logic gates • Conclusion and Summary of Unit
5.	Analysis & design of Combinational Logic
	<ul style="list-style-type: none"> • 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, subtractor, BCD adder, Binary comparator, arithmetic logic units • Sequential Logic, Sequential Circuits, Programmable Logic, Digital integrated circuits. • Conclusion and Summary of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	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	Robert L. Boylestad & Louis Nashelsky	Latest	Pearson
4.	Electronic devices and circuits	Jacob Millman, and C.C. Halkias	Latest	TMH
5.	Digital Electronics	William Kleitz	Latest	PHI
Websites				
<ul style="list-style-type: none"> • https://nptel.ac.in/courses/108102112 https://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 Mapping

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

COURSE OUTCOMES: 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 hash 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 THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction And Basic Data Structures
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • Trees: Preliminaries-Binary Tree- Tree traversals-Binary search Trees-AVL Trees. • Conclusion and Summary of Unit
3.	Sorting And hashing

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • Elementary Graph Algorithms-Minimum Spanning Trees-Single-source shortest paths- • All pairs shortest paths. • Conclusion and Summary of Unit

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				
<ul style="list-style-type: none"> □ www.electronicsdevices.com/; www.pearsonhighered.com;www.khanacademics.com □ www.mindtools.com □ www.tryscience.com □ www.khaki.com □ www.Raifoundation.org □ www.tryengineering.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

COURSE OUTCOMES: 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 THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	SOLAR ENERGY
	<ul style="list-style-type: none"> • 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.	WIND ENERGY
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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				
<ul style="list-style-type: none"> • www.electronicdevices.com/; www.pearsonhighered.com/;www.khanacademics.com • www.mindtools.com • www.tryscience.com • www.khaki.com • www.Raifoundation.org • www.tryengineering.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	—	—

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.	To perform parallel operation of two (a) 1-phase transformers (b) 3-phase transformers and determine their load sharing
5.	To study the performance of 3-phase transformer for its various connections, i.e .star/ star star / delta delta / star and delta/delta and find the magnitude of 3rd harmonic 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.
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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	PSO3
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 OF EXPERIMENTS:

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 inheritance, 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	PSO3
LO1	—	—	3

LO2	—	—	2
LO3	—	—	3
LO4	—	—	2.75
LO5	—	—	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 of form factor of a rectified 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 the 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 the concerned guide
 - a). The topic should be related to the branch but it should be an extended part of the branch (latest and advanced topic).
 - b). The topic should be such that the student can gain the latest knowledge. Students should preferably refer to at least one research paper
3. Seminar topics should not be repeated in the department and registration of the same should be done on a first come first served basis.
4. Seminar report should be submitted in paper-bound copy prepared with computer typing
 - a). The size of the report depends on the advancement of the topic.
 - b). Students should preferably refer minimum of 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: BERCEE3205-

JAVA LAB

2 Credit [LTP: 0-0-2]

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

- CO1- Describe object oriented concepts, java program structure and its installation.
- CO2 Demonstrate Object oriented constructs such as various class hierarchies, interfaces and Packages.
- CO3 Develop and understand Exception handling.
- CO4 To understand the concepts of threads and I/O in Java.
- CO5 Able to build dynamic user interfaces using applets and Event handling in java.

LIST OF EXPERIMENTS:

1.	Use Eclipse or Net bean platform and acquaint with the various menus. Create a test project, add a test class, and run it.
2.	Write a Java program that works as a simple calculator
3.	a) Develop an applet in Java that displays a simple message. b) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text
4.	Write a Java program that creates a user interface to perform integer divisions.

5	Write a Java program that implements a multi-thread application that has three threads.
6	Write a Java program for the following: Create a doubly linked list of elements. Delete a given element from the above list.
7	Write a program to generate a set of random numbers between two numbers x1 and x2, and x1>0. b) Write a program to implement a new ArrayList class.
8	Write a program that reads file name from the user then displays information about that file.
9	Write a program that reads two numbers from the user to perform integer division into Num1 and Num2 variables.
10	Write a program that creates 3 threads by extending the Thread class. Write a program to illustrate Thread synchronization.
11	Create a JApplet that displays a message which is scrolling from left to right and vice versa. Write a program that displays a sample registration page using Swing controls use appropriate layout managers.
12	Create an interface containing 3 radio buttons named line, rectangle and oval. Based on the radio button selected, allow user to draw lines, rectangles or ovals as per the locations selected by the user.
13	For program check all the fields filled or not, display success dialogue if all fields are filled with the help of ActionListener.
14	Write a program to create three JSliders where each represents colors RED, GREEN and BLUE.
15	Write a program that implements a simple client/server application.

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

CO	At the end of this course, learners will be able to:	Bloom Level
CO – 01	Compare the professional and personal approach towards any task and demonstrate their understanding by displaying professional attitude in the assigned tasks.	
CO – 02	Recognize, explain, and use the formal elements of specific genres of organizational written communication: reports, proposals, memorandums, web pages, wikis, blogs, business letters, and promotional documents etc...	
CO – 03	Prepare and deliver a clear and fluent demonstrative, informative, and persuasive presentation and enlarge their vocabulary by keeping a vocabulary journal.	
CO – 04	Demonstrate preparedness for any type of interview from classic one-on-one interview to panel interviews, Phone/Skype interviews, Behavioral/Situational etc. along with sharpening the ability to critically analyze a given piece of information and collectively work in a group to arrive at a solution or develop a perspective.	
CO – 05	Understand negotiation and time management to identify steps for proper negotiation preparation & learn bargaining techniques and strategies of inventing options for mutual gain and move negotiations from bargaining to closing.	

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Professional Attitude & Approach	6
2.	Professional Writing-I	8
3.	Presentation Skills: Structure Study	2
4.	Interview Skills & Group Discussion	4
5.	Negotiation Skills & Time Management	4

B. DETAILED SYLLABUS

LIST OF LABS

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

C. COs AND POs MAPPING

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

D. COs AND PSOs MAPPING

COs andPSOs	PSO1	PSO2	PSO3
CO.1			
CO.2			
CO.3			
CO.4			
CO.5			

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

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

CO	At the end of this course, learners will be able to:	Bloom Level
CO – 01	Recall key factors influencing microclimates.	L1
CO – 02	Explain the principles of efficient irrigation practices.	L2
CO – 03	Design lighting controls to meet energy efficiency standards.	L3
CO – 04	Evaluate the environmental impact of different construction materials.	L4
CO – 05	Recall codes and standards related to indoor air quality.	L1

A. OUTLINE OF THE COURSE

Unit No.	Title of The Unit	Time required for the Unit (Hours)
1.	Sustainable Architecture & Sites	6
2.	Water Management	8
3.	Energy Management	10
4.	Sustainable Building Materials	6
5.	Indoor Environmental Quality	10

B. DETAILED SYLLABUS

Unit	Unit Details
1.	Sustainable Architecture & Sites
	<ul style="list-style-type: none"> • Introduction of Unit • Integrated Approach for Green Building design: Factors for Site selection, Understanding Site Ecology & Site Analysis • Soil erosion & pollution control measures: types of Soil Erosion, strategies to Mitigate Land Degradation, Design Techniques & Challenges • Microclimate: Factors affecting microclimate & heat Islands, Strategies to handle heat island in built environment, Designing Green Spaces and Enhancing Biodiversity in built environment • Universal Design: Key accessibility issues and Design guidelines • Conclusion of Unit
2.	Water Management
	<ul style="list-style-type: none"> • Introduction of Unit • Water Balance and approach for water efficiency: 3R Approach for water efficiency – Reduce, Reuse/ Recycle and Recharge • Water efficient plumbing fixtures, Standards & Codes • Efficient irrigation practices – Hydrozoning, Control devices for water supply, Irrigation systems – Drip & Sprinklers • Wastewater treatment & reuse, wastewater treatment technologies: Physical, Biological and Natural • Rainwater harvesting and utilisation, Groundwater recharge techniques: Design considerations • Conclusion of Unit
3.	Energy Management
	<ul style="list-style-type: none"> • Introduction of Unit

	<ul style="list-style-type: none"> • Introduction, Performance Evaluation and Approach for Energy Efficiency in Buildings • Energy Efficiency Standards & Codes: ECBC 2017 & EPI, ASHRAE 90.1, ASHRAE 62.1, ASHRAE 55, ASHARE 170, ISHRAE 1001, Star labelling for appliances • Efficient Building Envelope: Heating loads in buildings, Building orientation and form, Envelope Heat Transfer & Material Specifications – Wall, Roof & Fenestration • Air Conditioning: Types of air conditioning systems, Design Considerations and control systems • Lighting in Building: Daylighting & Artificial Lighting, Methods to determine ECBC compliance for interior lighting and Lighting Controls • Renewable Energy systems and technologies • Conclusion of Unit
4.	Sustainable Building Materials
	<ul style="list-style-type: none"> • Introduction of Unit • Attributes of Sustainable Building Materials: Recycled content, Regional material, Renewable material, Embodied energy, Embodied carbon, Material performance, Recyclability, Elimination of hazardous materials • Ecolabeling of Products: Types of Ecolabels – Type I, II & III • Sustainable Materials for Green Buildings: Ready mix concrete, Construction Blocks, Glass, Steel TMT Bars, Construction Chemicals, Insulation Materials, Cement, Paints • Waste management during construction & post-occupancy: Segregation strategies, Types of waste management – organic, inorganic, e-waste, hazardous waste • Conclusion of Unit
5.	Indoor Environmental Quality
	<ul style="list-style-type: none"> • Introduction of Unit • Indoor Air quality: Codes and Standards, Fresh air requirements, Design considerations • Approach for improving Indoor air quality: Measures to reduce sick building syndrome, Demand control ventilation, CO2 monitoring in buildings, Air quality monitoring • Enhancing occupants' Comfort, Health and Wellbeing: Thermal Comfort, Visual Comfort, Acoustics, Ergonomics, Olfactory Comfort. • Conclusion of Unit

C. RECOMMENDED STUDY MATERIAL:

S.No	Reference Book	Author	Edition	Publisher
1.	Guide on Green Built Environment	IGBC	2019	IGBC
2.	IGBC Green Homes rating system	IGBC	2021	IGBC

D. COs AND POs MAPPING

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

E. COs AND PSOs MAPPING

COs andPSOs	PSO1	PSO2	PSO3
CO.1	3	-	-
CO.2	3	-	-
CO.3	1	-	-
CO.4	3	-	-
CO.5	3	-	-

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

POORNIMA UNIVERSITY, JAIPUR

Faculty of Engineering and Technology

Name of Program: B.Tech. in Electrical and Computer Engineering

Duration: 4 Years

Teaching Scheme for Batch 2024-28

Semester-IV

Course Code	Name of Course	Teaching Scheme			SH	Marks			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		40	60	100	3
BERCCE4103	Computer Networks	3	0	0		40	60	100	3
BERCEE4104	Electronic Device and Circuit	3	0	0		40	60	100	3
A.2	Practical								
BERCEE4201	Control and Automation Lab	0	0	2		60	40	100	1
BERCCE4202	OOPS LAB	0	0	2		60	40	100	1
BERCCE4203	Computer Networks	0	0	2		60	40	100	1
		Minor Stream Courses / Department Electives							
B.1	Theory								
BERECE4111	Object Oriented Programming								
BERECE4112	Operating Systems	3	0	0		40	60	100	3
BEREEE4113	Energy and Environment								
B.2	Practical								
C		Multidisciplinary Courses (MC)							
BEREBX4109	MOOC Course-III	2	0	0		40	60	100	2
D		Ability Enhancement Courses (AEC)							
BUACHM4213	LEADERSHIP COMMUNICATION LAB	0	0	2		60	40	100	1
E		Skill Enhancement Courses (SEC)							
BULCSE4201	Skill Enhancement Generic Course-IV	0	0	2		60	40	100	1
BERCSE4202	Skill Enhancement Generic Course-V	0	0	2		60	40	100	1
F		Value Added Courses (VAC)							
	-	-	-	-					
G		Summer Internship / Research Project / Dissertation							
Total		17	1	12					24
Total Teaching Hours		30/30							24

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 THE COURSE

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

B. DETAIL SYLLABUS

Unit	Unit Details
1.	<p>Graph Theory</p> <ul style="list-style-type: none"> • 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.	<p>Network Theorems</p> <ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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.	CircuitsandNetworksAnalysis andSynthesis	Sudhakar A.Shyammohan	1st	TataMcGraw-Hill
5.	CircuitsTheory	A.Chakrawarty	2nd	Dhanpat Rai &Co.
Webs ites				

- www.electronicdevices.com/;www.pearsonhighered.com
- www.mindtools.com
- www.tryscience.com
- www.khaki.com
- www.Raifoundation.org
- www.tryengineering.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	-	-

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

- CO1** Analyze the characteristic of open loop and open loop system to reduce the disturbance.
CO2 Design specifications of second order systems and evaluate their response.
CO3 Synthesize the control system components and discuss the concept of stability and necessary conditions
CO4 Perform frequency domain analysis of linear control system using various frequency response methods
CO5 Construct various closed loop systems using compensation techniques in time domain and frequency domain

A. OUTLINE OF THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	Control System and Control System Components
	<ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> • 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 indices • Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots. • Nyquist stability criterion, Assessment of relative stability: gain margin and phase margin, constant M & N circles • Conclusion and Summary of Unit
3.	Digital Control Systems
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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 STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
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.tryengineering.com
- <https://nptel.ac.in/courses/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	–	–

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 taking 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 THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	Networking Fundamentals
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • WhatIs a WAN?, WAN Switching, WAN Switching techniques Circuit Switching,PacketSwitchingetc., • ConnectingtotheInternet:PSTN,ISDN,DSL,CATV,Satellite- BasedServices,LastMileFibre,Cellular

	<p>Technologies</p> <ul style="list-style-type: none"> • Connecting LANs: Leased Lines, SONET/SDH, Packet Switching, Remote Access: Dial-up Remote Access, Virtual Private Networking, SSL VPN, Remote Terminal Emulation, Network security: Authentication and Authorization, Tunneling and Encryption Protocols, IPSec, SSL and TLS, Firewall, Other Security • Appliances, Security Threats • Conclusion and Summary of Unit
5.	Network Operating Systems and Trouble shooting Network
	<ul style="list-style-type: none"> • Introduction of Unit • Network Operating Systems: Microsoft Operating Systems, Novell NetWare, UNIX and Linux Operating Systems, Macintosh Networking • Trouble Shooting Networks: Command-Line interface Tools, Network and Internet Troubleshooting, Basic Network • Troubleshooting: Troubleshooting Model, identify the affected area, probable cause, implement a solution, test the result, recognize the potential effects of the solution, document the solution • Using Network Utilities: ping, traceroute, tracert, ipconfig, arp, nslookup, netstat, nbtstat, Hardware trouble • Shooting tools, system monitoring tools • Conclusion and Summary of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	CCNA Cisco Certified Network	Todd Lammle	Latest	7th Edition (Paperback),
2.	CCENT/CCNA ICND1 640-822 Official	Wendell Odom	Latest	3 Edition (Paperback),
3.	Routing Protocols and Concepts CCNA Exploration Companion Guide (With	Rick Graziani	Latest	Pearson, 2008
4.	CCNA Exploration Course Booklet:	Cisco Networking	Latest	Pearson, 2010

D. CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	3	2	2	1	–	–	–	–	–	–	–	–
C02	3	3	1	1	–	–	–	–	–	–	–	–
C03	2	2	1	1	–	–	–	–	–	–	–	–
C04	2	2	2	1	–	–	–	–	–	–	–	–
C05	2	2	2	1	–	–	–	–	–	–	–	–

E. CO-PSO Mapping

	PSO1	PSO2	PO3
C01	—	2	2
C02	—	3	2
C03	—	1	2
C04	—	—	3
C05	—	—	2

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

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

A. OUTLINE OF THE COURSE

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

B. DETAILED SYLLABUS

Unit	Unit Details
1	PN Junction Diodes
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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)
	<ul style="list-style-type: none"> • 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.
	<ul style="list-style-type: none"> • Applications • Conclusion and Summary of Unit

4	Field Effect Transistors
	<ul style="list-style-type: none"> • Introduction of Unit • Construction of FET • FET operation: V-I characteristics and transfer characteristics of JFET. • Types of field-effect transistors • MOSFET: Enhancement type and depletion type: construction, working, V-I characteristics, and transfer characteristics. • DC analysis of FETs. FET as a voltage variable resistor. FET small signal models. FET as a switch. CMOS. • Advantages of FET over "BJT" • Conclusion and Summary of Unit
5	Oscillators and Operational Amplifiers
	<ul style="list-style-type: none"> • Introduction of Unit • Classification of oscillators and Criterion for oscillation. • RC-phase shift, Hartley, Colpitts, Wein Bridge and crystal oscillators. • Operational amplifier: inverting and non-inverting modes • Characteristics of ideal op-amp. • Basic op-amp applications: Adder, Integrator, Differentiator, comparators

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Electronic Devices and Circuits	David A. Bell	Latest	Oxford
2.	Electronic Devices and Circuit theory	Boylestad	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 Mottershead	Latest	PHI
7.	Power Electronics Circuits, Devices and Applications	M.H. Rashid	Latest	Prentice Hall India, New Delhi
Websites				
<ul style="list-style-type: none"> • khanacademy.com • https://nptel.ac.in/courses/108/108/108108122/ 				

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 Quadrature 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 THE COURSE

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
	<ul style="list-style-type: none"> □ Introduction of Unit □ Concept of class and object, attributes, public, private and protected members, derived classes, single & multiple inheritance, □ Conclusion and Summary of Unit
2.	Programming in C++

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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.tryengineering.com
- www.Raifoundation.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

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. OUTLINE OF THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction to Operating System
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • Process Synchronization: Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OS

	<ul style="list-style-type: none"> • Synchronization, Atomic Transactions. • Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, • Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. • Conclusion and Summary of Unit
4.	Storage Management
	<ul style="list-style-type: none"> • Introduction of Unit • Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. • Virtual Management: Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation • File-System Interface: File concept, Access Methods, Directory structure, File-system Mounting, File sharing, Protection and consistency semantics. • File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery. • Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation • Conclusion and Summary of Unit
5.	Protection and Security
	<ul style="list-style-type: none"> • Introduction of Unit • Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability- Based Systems, Language – Based Protection • Security: Security Problem, User Authentication, One-Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications • Conclusion and Summary of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Operating System Concepts and Design	Milan Milonkovic	Latest	II Edition, McGraw Hill 1992.
2.	Operation System Concepts	Tanenbaum	Latest	2 nd Edition, Pearson Education
3.	Operating System	Silberschatz /Galvin/Gagne	Latest	6th Edition, WSE(WILEY Publication)
4.	Operating System	William Stallings	Latest	4 th Edition, Pearson Education.

]

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

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.	Energy Auditing Techniques	8
2.	Basic Electrical Systems	8
3.	Electric Motors: ECO	8
4.	Environment pollution, global warming and climate	8
5.	Energy technologies and environment	8

B. DETAILED SYLLABUS:

Unit	Unit Details
1.	Energy Auditing Techniques
	<ul style="list-style-type: none"> • Introduction of Unit • Energy Auditing Techniques: Definition, Energy audit-need, Types of energy audit, Energy management (audit) approach- understanding energy costs, Benchmarking, Energy performance, Matching energy use to • Requirement, Maximizing system efficiencies, optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments. , • Methodologies of Conducting Energy Audit: Preliminary & Detailed Energy Audit Methodology: Preliminary Questionnaire, Review of Previous Records, Introductory Meeting, Walkthrough Tour, Flow Chart Construction for Detail Energy Audit, Identification of Required Audit Instruments, Finalization of Audit Schedule with the Company, Getting Detailed Data. • Energy Audit Report: Outlines of Energy Audit Report Format, Identification and Techno economic • Analysis of Energy Conservation Measures, Classification of Energy Conservation Measures • Conclusion and Summary of Unit
2.	Basic Electrical Systems

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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 gandynamics; Energy flow in ecosystems; Biogeochemical cycles and climate; Population and communities • Conclusion and Summary of Unit
5.	Energy technologies and environment
	<ul style="list-style-type: none"> • 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	Publi cation
1.	Bharucha, E., Textbook of Environmental Studies	Bharucha	2nd	UniversitiesPress
2.	Ecology-Principles andApplication	Chapman, J.L. and Reiss, M.J	1st	CambridgeUniversityP ress(LPE)
3.	EnvironmentalStudies	Joseph,B	1st	TataMcGraw-Hill
4.	D.R.EnergyEfficiencyforEngineersandTec hnologists	Eastop, T.P. andCroft	2nd	Longman andHarow
5.	EnvironmentalScience	Miller,G.T	2nd	Thomson
6.	EnergyMangement	O'Callagan	3rd	M cGrawHillBookCo.Lt d
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.tryengineering.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

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 ω_n 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 find 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

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 <ul style="list-style-type: none">- 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 <ul style="list-style-type: none">- 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 <ul style="list-style-type: none">- Operator Overloading including Unary and Binary Operators, Function Overloading
4.	Runtime Polymorphism <ul style="list-style-type: none">- Inheritance, Virtual functions- Virtual Base Classes, Templates- File Handling-Sequential access, Random access.

Virtual Lab-

<https://cse01-iiith.vlabs.ac.in/>

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>

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

CO	At the end of this course, learners will be able to:	Bloom Level
CO – 01	Learn how to update and manage the experience, education, and skills & expertise sections on social media & formulate appropriate updates as a means to promote business activities.	
CO – 02	Understand how to leverage grammar and formatting in formal documents & demonstrate how to follow the stages of the writing process.	
CO – 03	Evaluate presentation's weak spots and areas for improvement & learn, practice and acquire the skills necessary to deliver effective presentation with clarity and impact.	
CO – 04	Evaluate basic factors such as personal skills & abilities, career fields, willingness to learn and strengthen the chances to get desirable jobs.	
CO – 05	Understand negotiation and team skills dynamics and how to prepare for uncertainty & learn to craft agile strategy and be quick on your feet in changing circumstances.	

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	Personal Branding	2
2.	Professional Writing-II	8
3.	Presentation Skills: Professional Setting	2
4.	Job Interview & Group Discussion: Preparation by Mock Practice	4
5.	Negotiation Skills, Team Management & Professional Awareness	8

B. DETAILED SYLLABUS

LIST OF LABS	
1.	Introduction
2.	Definition of communication, communication process, informal communication, non-verbal, speakers vs communicators
3.	How leaders communicate, skills of a good communicator,
4.	40 question self-assessment, making sure your message matters, choosing your words, improving your skills
5.	Definition of defensive/non-defensive communication & 5 skills for communicating non-defensively.
6.	Definition of feedback, giving feedback, 10 common feedback mistakes, 5 tips on receiving feedback, 10 tips for dealing with difficult people.
7.	Barriers to listening, what is listening, listening vs hearing, bad listening habits, active listening
8.	Advanced Group Discussion-II: Analysis of professional GD Videos and Practices on Topics/Video/Article based topics

9.	When to use/not use e-mail, e-mail etiquette, when to use/not use telephone and video conferencing, 7-tips on telephone etiquette
10.	Planning your presentation, building, audio-visual aids, giving presentation, audience rapport overcoming stage fright.
11.	Team Building Strategies: Project Management
12.	Career Awareness & Productive Mindset

C. COs AND POs MAPPING

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

D. COs AND PSOs MAPPING

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

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

POORNIMA UNIVERSITY, JAIPUR									
Faculty of Engineering and Technology									
Name of Program: B.Tech. in Electrical and Computer Engineering									
Durati									
Teaching Scheme for Batch 2024-28									
Semester-V									
Course Code	Name of Course	Teaching Scheme			Marks				Credits
		Lecture	Tutorial (T)	Practical (P)	SH	IE	ES	Total	
A.		Major (Core Courses)							
A.1	Theory								
BERCEE5101	Electrical Power Generation, Transmission and Distribution	3	0	0		40	60	100	3
BERCEE5102	Power Electronics and Drives	3	0	0		40	60	100	3
BERCEE5103	Microprocessor and Microcontrollers	3	0	0		40	60	100	3
BERCEE5104	Artificial Intelligence & Expert	3	0	0		40	60	100	3
A.2	Practical								
BERCEE5201	Microprocessor and Microcontroller Lab	0	0	2		60	40	100	1
BERCEE5202	Power Electronics and Drives	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)								
BERECE5111	Embedded System & IOT	3	0	0		40	60	100	3
BERECE5112	Hydrogen Energy and Fuel								
BERECE5113	Switchgear and Protection								
B.2	Practical								
C		Multidisciplinary Courses							
BEREBX5109	MOOC Course-IV	2	0	0					2
D		Ability Enhancement Courses (AEC)							
BUACHM5216	Professional Skills II	0	0	2		60	40	100	1
E		Skill Enhancement Courses (SEC)							
BULCSE5201	SETC-I	0	0	2		60	40	100	1
BULCSE5202	Skill Enhancement	0	0	2		60	40	100	1
F		Value Added Courses (VAC)							
		-	-	-					
G		Summer Internship / Research Project /							
Total		17	0	14					
Total Teaching Hours		30/30							24

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 THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	Conventional and Non-conventional Energy Sources
	<ul style="list-style-type: none"> • 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.
	<ul style="list-style-type: none"> • New Energy Sources: Impact of thermal, gas, hydro and nuclear power stations on environment. Green House Effect (Global Warming). Renewable and nonrenewable energy sources • Conservation of natural resources and sustainable energy systems. Indian energy scene. Introduction to electric energy generation by wind, solar and tidal. • Conclusion and Summary of Unit
2.	Power Plant Economics

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • 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

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 of I/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 THE COURSE

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 8051 Microcontroller	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction to Microprocessor
	<ul style="list-style-type: none"> • Introduction of Unit • Microprocessor evolution and development. • System buses and operation. • 8085 microprocessor: Architecture • Conclusion and Summary of Unit
2.	Microprocessor Architecture and System Bus
	<ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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				
<input type="checkbox"/> https://nptel.ac.in/courses/108/107/108107142/				
<input type="checkbox"/> 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

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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> • Introduction to unit • Step Up/Down Converter, 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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

Webs ite s

- ☐ <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

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

COURSE OUTCOMES: 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 knowledge.

CO5 Study the concepts of expert systems.

A. OUTLINE OF THE COURSE

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

B. DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction to AI
	<ul style="list-style-type: none"> • Introduction of Unit • Introduction to AI: Intelligent agents – Perception • Natural language processing – Problem Solving agents • Searching for solutions: Uniformed search strategies • Informed search strategies. • Conclusion and Summary of Unit
2.	Knowledge and Reasoning
	<ul style="list-style-type: none"> • Introduction of Unit • Adversarial search , Optimal and imperfect decisions, Alpha, Beta pruning • Logical agents: Propositional logic, First order logic – • Syntax and semantics Using first order logic, Inference in first order logic. • Conclusion and Summary of Unit
3.	Uncertain Knowledge and Reasoning
	<ul style="list-style-type: none"> • Introduction to unit • Uncertainty, Acting under uncertainty • Basic probability notation, Axioms of probability, Baye's rule, Probabilistic reasoning, Making simpl • Conclusion and Summary of Unit
4.	Planning and Learning

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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

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

CO-1- To have a comprehensive understanding of 8-bit microcontroller architecture, instruction set, and programming, including parallel ports, timers, serial ports, and interrupt handling.

CO2- Master memory and I/O device interfacing, embedded system programming in C, RTOS needs, multiple task management, context switching, and priority-based scheduling.

CO3- Learn the fundamentals of IoT devices, Arduino types and toolchain, programming structure, and integrating sensors and actuators with Arduino.

CO4- Understand IoT communication models, protocols, and APIs, including Bluetooth, WiFi, ZigBee, GPS, GSM, and open platforms like Raspberry Pi for cloud connectivity.

CO5- Develop embedded systems and IoT applications, focusing on practical implementations in home automation, smart agriculture, smart cities, and smart healthcare.

A. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit (Hours)
1.	8-Bit Embedded Processor	8
2.	Embedded C Programming	8
3.	IOT And Arduino Programming	8
4.	IOT Communication And Open Platforms	8
5.	Applications Development	8

B. DETAILED SYLLABUS

Unit	Unit Details
1.	8-Bit Embedded Processor
	<ul style="list-style-type: none"> • Introduction of Unit • 8-Bit Microcontroller – • Architecture – Instruction Set and Programming – • Programming Parallel Ports – Timers and Serial Port – Interrupt Handling. • Conclusion and Summary of Unit
2.	Embedded C Programming
	<ul style="list-style-type: none"> • Introduction of Unit • Memory And I/O Devices Interfacing – • Programming Embedded Systems in C – • Need For RTOS – • Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies. • Conclusion and Summary of Unit
3.	IOT And Arduino Programming

	<ul style="list-style-type: none"> • Introduction of Unit • Introduction to the Concept of IOT Devices – IOT Devices Versus Computers – IOT Configurations – Basic Components – Introduction to Arduino – Types of Arduino – Arduino Toolchain – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino. • Conclusion and Summary of Unit
4.	IOT Communication And Open Platforms
	<ul style="list-style-type: none"> • Introduction of Unit • IOT Communication Models and APIs – IOT Communication Protocols – Bluetooth – WiFi – ZigBee – GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud. • Conclusion of Unit including real life application
5.	Applications Development
	<ul style="list-style-type: none"> • Introduction of Unit • Complete Design of Embedded Systems – Development of IOT Applications – Home Automation – Smart Agriculture – Smart Cities – Smart Healthcare. • Conclusion and Summary of Unit

C. RECOMMENDED STUDY MATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1.	Embedded Systems: Architecture, Programming and Design	Raj Kamal	3rd	McGraw-Hill Education
2.	Internet of Things: A Hands-On	Arshdeep	1st	Universities Press
3.	Programming Arduino: Getting Started with Sketches	Simon Monk	2nd	McGraw-Hill Education
Websites				
	<ul style="list-style-type: none"> ▫ 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

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 THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	Fundamentals Of HVAC
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> • Introduction of Unit • Introduction–working and types of fuel cell–low, medium and high temperature fuel cell, liquid and methanol types, proton exchange 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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				
<ul style="list-style-type: none"> □ 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

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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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 and 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
	<ul style="list-style-type: none"> • Introduction of Unit • Air blast, SF6 and vacuum circuit breakers. Selection of circuit breakers, rating of circuit breakers • Digital Protection: Introduction to digital protection. Brief description of block diagram of digital relay • Introduction to digital overcurrent, transformer differential and transmission line distance protection. •

C. RECOMMENDED STUDY MATERIAL:

Sr.No	Reference Book	Author	Edition	Publication
1.	Switchgear and Protection	S. S. Rao	Latest	Khanna Publishers
2.	Power system Protection and Switchgear	B. Ravindranath and M. Chande	Latest	Wiley
3.	Fundamentals of Power System Protection	Y. G. Paithankar and S R Bhide	Latest	PHI
4.	Power System Protection: Static Relays with Microprocessor Application	T.S.M Rao	Latest	Tata Macgraw Hill
5.	Protective Relays- Their Theory and Practice, Vol. I & II	A.R. Van C. Warrington	Latest	Jhon Willey & Sons
Websites				
<ul style="list-style-type: none"> • https://nptel.ac.in/courses/108101039/ • https://nptel.ac.in/content/storage2/courses/108101039/download/Lecture-1.pdf 				

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.
Analyze the conversion (1) BCD to ASCII (2) BCD to hexadecimal, multiply two 8 bit numbers
- CO3** and generate and sum 15 Fibonacci numbers
- CO4** Analyze for rolling display of message "india", insert a number at correct place in a sorted array, Reversing bits of an 8-bit number. Fabrication of 8-bit LED I/O interfaces for 8085 kit through
- CO5** Design a code for display addition application.

LIST OF EXPERIMENTS

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.	Transfer of a block of data in memory to another place in memory, Transfer of block to another location in
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 message "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

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 OF EXPERIMENTS

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>

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 OF EXPERIMENTS

1.	Study and Analysis of Electric Rickshaw Motor kit
2.	Study and Analysis of BLDC motor-based EV
3.	Study and Analysis of PMSM based Electric vehicle
4.	Study and analysis of Induction motor based electric vehicle.
5.	Study of off-grid solar Inverter
6.	Study of 4 Leg Semikron Stack
7.	Solar based EV Charging station.
8.	Study of control parameters of electric vehicle system
9.	Study of hybrid electric vehicle system.
10.	Study and Analysis of Battery management system.

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

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

CO	At the end of this course, learners will be able to:	Bloom Level
CO – 01	Recall and comprehend the principles of effective presentation skills, technical content delivery, and audience engagement.	L1
CO – 02	Apply research methodologies to select seminar topics and structure seminar content effectively.	L3
CO – 03	Create and deliver a final seminar presentation incorporating learned skills and feedback for continuous improvement.	L5

A. LIST OF EXPERIMENTS

1. Topic selection and research techniques for engaging seminar topics.
2. Structuring seminar content with clear introductions and conclusions.
3. Developing effective presentation skills including voice modulation and body language.
4. Utilizing visual aids like slides and charts to enhance presentations.
5. Implementing strategies to capture and maintain audience engagement.
6. Delivering technical content clearly and concisely.
7. Handling technical issues and managing time during presentations.
8. Participating in peer feedback sessions for constructive criticism.
9. Applying feedback to improve presentation skills and content clarity.
10. Delivering a final seminar presentation incorporating learned skills and receiving evaluation for further enhancement.

B. VIRTUAL LAB

- <https://www.youtube.com/watch?v=BPdzkfkFnvw>
- <https://www.youtube.com/watch?v=hqXFPq676iM>
- <https://www.youtube.com/watch?v=0OUwEDorYg>

C. COs AND POs MAPPING

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

D. COs AND PSOs MAPPING

COs and PSOs	PSO1	PSO2	PSO3
CO.1	3		
CO.2	1		
CO.3	2		

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

CO	At the end of this course, learners will be able to:	Bloom Level
CO – 01	Learn how to update and manage the experience, education, and skills & expertise sections on social media & formulate appropriate updates as a means to promote business activities.	
CO – 02	Understand how to leverage grammar and formatting in formal documents & demonstrate how to follow the stages of the writing process.	
CO – 03	Evaluate presentation's weak spots and areas for improvement & learn, practice and acquire the skills necessary to deliver effective presentation with clarity and impact.	
CO – 04	Evaluate basic factors such as personal skills & abilities, career fields, willingness to learn and strengthen the chances to get desirable jobs.	
CO – 05	Understand negotiation and team skills dynamics and how to prepare for uncertainty & learn to craft agile strategy and be quick on your feet in changing circumstances.	

A. OUTLINE OF THE COURSE

Unit	Title of the unit	Time Required for the Unit (Hours)
1	Personal Branding	2
2	Professional Writing-II	8
3	Presentation Skills: Professional Setting	2
4	Job Interview & Group Discussion: Preparation by Mock Practice	4
5	Negotiation Skills, Team Management & Professional Awareness	8

B. DETAILED SYLLABUS

LIST OF LABS

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

POORNIMA UNIVERSITY, JAIPUR Faculty of Engineering and Technology									
Name of Program: B.Tech. in Electrical and Computer Engineering					Duration: 4 Years				
Total Credits: 171									
Teaching Scheme for Batch 2024-28									
Semester-VI									
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								
BERCCE6101	Theory and Practical Aspect of Machine Learning	3	0	0		40	60	100	3
BERCEE6102	Power System Analysis	3	1	0		40	60	100	4
BERCCE6103	Data Base management System	3	0	0		40	60	100	3
BERCCE6104	Computational Theory and Compiler Design	3	0	0		40	60	100	3
A.2		Practical							
BERCEE6201	Power System Lab	0	0	2		60	40	100	1
BERCCE6202	Natural Language processing	0	0	2		60	40	100	1
BERCCE6203	DBMS Lab	0	0	2		60	40	100	1
BERCCE6204	Compiler Design Lab	0	0	2		60	40	100	1
BERCCE6205	Cloud Computing Lab	0	0	2		60	40	100	1
B.		Minor Stream Courses/ Department Electives							
B.1		Theory (Any One)							
BEREEEE6111	Solar Thermal Engineering Processes	3	0	0		40	60	100	3
BEREEEE6112	EHV AC/DC Transmission								
BERECE6113	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							
BERCEE6301	Minor Project	0	0	4		60	40	100	2
Total		15	1	14					23
Total Teaching Hours		30 / 30							23

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. DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction to ML
	<ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • Probabilistic Generative Models: DBN, RBM • Deep Generative Models: Encoder-Decoder, Variational Auto encoder, • Generative Adversarial Network (GAN), Deep Convolution GAN, • Variants and Applications of GANs • Conclusion of Unit including real life applications

C. RECOMMENDED STUDY MATERIAL:

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/>

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 THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	<p>Basic Concepts</p> <ul style="list-style-type: none"> • 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.	<p>Fault Analysis and Protection Systems</p>

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> □ Conclusion and Summary of Unit
4.	Stability Constraints in synchronous grids
	<ul style="list-style-type: none"> • 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 4th 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.

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 THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	DBMS Architecture
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • 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.

	<ul style="list-style-type: none"> • Conclusion and Summary of Unit
4.	Internal of RDBMS
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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 STUDY MATERIAL:

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.

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 THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction to Languages and Grammars
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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.	Myhill-Nerode Theorem

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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-Peepphole 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	• Pearson Education
Websites			
https://nptel.ac.in/courses/108104013/ https://nptel.ac.in/courses/108108099/			

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 THE COURSE

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
	<ul style="list-style-type: none"> Introduction of Unit Principles of renewable energy: Fundamentals; Scientific principles, technical implications, and social implications, Different types of Renewable Energy Sources, Sun as a Source of Energy, Solar Radiation, Extra Terrestrial at Earth's Surface–Horizontal, Tilted Surface, Estimation of Radiation, Attenuation 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
	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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:
	<ul style="list-style-type: none"> • 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				
<ul style="list-style-type: none"> □ https://nptel.ac.in/courses/112105051/ □ https://nptel.ac.in/content/storage2/courses/112105050/m111.pdf 				

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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • Introduction 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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
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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			
<ul style="list-style-type: none"> • https://nptel.ac.in/courses/108104013/ • https://nptel.ac.in/courses/108108099/ 			

Code: BERECE6113

WIRELESS SENSOR NETWORK

3 Credits [LTP: 3-0-0]

COURSE OUTCOMES: After Successful completion of the course students will be able to-
CO1 Describe the overview of wireless sensor networks and enabling technologies for wireless sensor networks

CO2 Apply the design principles of WSN architectures and operating systems for simulating environment situations.

CO3 Apply various concepts for assignment of MAC addresses.

CO4 Select the appropriate infrastructure, topology, joint routing and information aggregation for wireless sensor networks

CO5 Analyse the sensor network platform and tools state-centric programming.

OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Overview of Wireless Sensor Networks	7
2.	Architectures of WSN	9
3.	Networking Sensors	8
4.	Infrastructure Establishment	9
5.	Sensor Network Platforms and Tools:	9

A. DETAILED SYLLABUS

Unit	Unit Details
1.	OVERVIEW OF WIRELESS SENSOR NETWORKS <ul style="list-style-type: none">□ Introduction of Unit□ Single-Node Architecture - Hardware Components-□ Network Characteristics- unique constraints and challenges,□ Enabling Technologies for Wireless Sensor Networks-□ Types of wireless sensor networks.□ Conclusion and Summary of Unit
2.	ARCHITECTURES OF WSN <ul style="list-style-type: none">□ Introduction of Unit□ Network Architecture- Sensor Networks Scenarios- Design Principle, Physical Layer and Transceiver Design CO1, CO2 98 Considerations, Optimization Goals and Figures of Merit, Gateway Concepts, Operating Systems and Execution Environments- Introduction to TinyOS and nesC- Internet to WSN Communication□ Conclusion and Summary of Unit
3.	NETWORKING SENSORS:

	<ul style="list-style-type: none"> □ Introduction of Unit □ MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - SMAC, - B-MAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols EnergyEfficient Routing, Geographic Routing. □ Conclusion and Summary of Unit
4.	INFRASTRUCTURE ESTABLISHMENT
	<ul style="list-style-type: none"> • Introduction of Unit • Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control Conclusion and Summary of Unit
5.	SENSOR NETWORK PLATFORMS AND TOOLS:
	<ul style="list-style-type: none"> • Introduction of Unit • Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming. Conclusion and Summary of Unit

C. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Edition	Publication
1	Wireless Sensor Networks: Technology, Protocols, and Applications	Kazem Sohraby, Daniel Minoli, Taieb Znati	1st Edition	John Wiley & Sons, 2007
2	Protocols and Architectures for Wireless Sensor Networks	Holger Karl, Andreas Willig	1st Edition	John Wiley & Sons, 2005
3	Wireless Sensor Networks: An Information Processing Approach	Feng Zhao, Leonidas J. Guibas	1st Edition	Morgan Kaufmann, 2004
4	Wireless Sensor Networks: Principles and Practice	Fei Hu, Xiaojun Cao	1st Edition	CRC Press, 2010
5	Fundamentals of Wireless Sensor Networks: Theory and Practice	Waltenegus Dargie, Christian Poellabauer	1st Edition	John Wiley & Sons, 2010
6	Wireless Communications and Networking	William Stallings	1st Edition	Prentice Hall, 2002
7	Sensor Networks and Configuration: Fundamentals, Standards, Platforms, and Applications	Nitaigour P. Mahalik (Editor)	1st Edition	Springer, 2007

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 OF EXPERIMENTS:

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>

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 OF EXPERIMENTS:

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/>

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 OF EXPERIMENTS:

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

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

CO1 - Understand:

Demonstrate understanding of lexical analysis by designing a lexical analyzer that processes and ignores redundant spaces, tabs, new lines, and comments.

CO2 - Apply:

Apply lexical analyzer generation tools like JLex, flex, or lex to implement lexical analyzers effectively.

CO3 - Analyze:

Analyze and design predictive and LALR parsers for given languages, ensuring correct syntax parsing.

CO4 - Create:

Create abstract syntax trees by converting BNF rules into Yacc form and writing corresponding generation code.

CO5 - Evaluate:

Evaluate and generate machine code from abstract syntax trees and intermediate code representations, ensuring accurate symbol table implementation.

LIST OF EXPERIMENTS:

1.	Design a Lexical analyzer for the given language. The lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value.
2.	Implement the lexical analyzer using JLex, flex or lex or other lexical analyzer generating stools.
3.	Design Predictive parser for the given language.
4.	Design LALR bottom up parser for the given language.
5.	Convert the BNF rules into Yacc form and write code to generate abstract syntax tree.
6.	Write program to generate machine code from the abstract syntax tree generated by the parser.
7.	Implementation of Symbol Table.
8.	Generation of Code for a given Intermediate Code.
9.	Write a C program for implementing the functionalities of predictive parser for the mini language specified in Note 1.
10.	Write a C program for constructing of LL (1) parsing. b) *Write a C program for constructing recursive descent parsing.

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

- CO1 - Understand:** Demonstrate understanding of virtualization by installing VirtualBox/VMware Workstation with various Linux or Windows OS flavors on a Windows 7 or 8 host.
- CO2 - Apply:** Apply skills in virtual environments by installing a C compiler in a virtual machine and executing simple programs.
- CO3 - Create:** Create and deploy simple web applications using Google App Engine and GAE launcher, utilizing Python or Java.
- CO4 - Analyze:** Analyze cloud computing concepts by simulating a cloud scenario with CloudSim and running custom scheduling algorithms.
- CO5 - Evaluate:** Evaluate and implement procedures for advanced cloud tasks, including launching virtual machines using Trystack, setting up Hadoop single node clusters, transferring files between VMs, and solving practical case studies.

LIST OF EXPERIMENTS:

1.	Install Virtualbox / VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2.	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3.	Install Google App Engine. Create hello world app and other simple web applications using python/java.
4.	Use GAE launcher to launch the web applications.
5.	Simulate a cloud scenario using CloudSim.
6.	Design a scheduling algorithm that is not present in CloudSim.
7.	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version) .
8.	Install Hadoop single node cluster and run simple applications like wordcount.
9.	Find a procedure to transfer the files from one virtual machine to another virtual machine.
10.	Case Studies and Practical Applications Based Problems.

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

CO	Course Outcomes	Bloom Level
CO – 01	Understand the theoretical foundations and practical applications related to the chosen topic within civil engineering.	L2
CO – 02	Apply theoretical concepts and engineering principles to develop solutions or designs for real-world civil engineering problems	L3
CO – 03	Evaluate the feasibility, sustainability, and effectiveness of the proposed solutions, identifying strengths, weaknesses, and potential improvements	L4
CO – 04	Solve complex engineering problems within the project's scope by applying creative and innovative approaches	L5
CO – 05	Implement the proposed solutions or designs in a practical context, considering real-world constraints, sustainability, and ethical considerations	L6

GUIDE LINES:

1. The Project group in seventh term will continue the project work in eighth term and complete project in all respect (assembly, testing, fabrication, tabulation, test result etc.)
2. The group should maintain a log book of activities. It should have entries related to the worked one, problems faced, solution evolved etc., duly signed by guide.
3. The guides should regularly monitor the progress of the project work.
4. The project work along with project report should be submitted as part of term work in eighth term or before the last day of the seventh 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.

A. COs AND POs MAPPING

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

B. COs AND PSOs MAPPING

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

POORNIMA UNIVERSITY, JAIPUR

Faculty of Engineering and Technology

Name of Program: B.Tech. in Electrical and Computer Engineering **Duration: 4 Years**
Total Credits: 171

Teaching Scheme for Batch 2024-28

Semester-VII

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								
BERCEE7101	MOOC Course-V	3	0	0		40	60	100	3
A.2	Practical								
BERCEE7201	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							
BERCEE7401	Internship	0	0	12		40	60	100	6
Total		3	0	16					11
Total Teaching Hours		19							11

SH: Supporting Hours

***Classes will be conducted fortnightly.**

1. For the 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 the concerned guide
 - a). The topic should be related to the branch but it should be an extended part of the branch (latest and advanced topic).
 - b). The topic should be such that the student can gain the latest knowledge. Students should preferably refer to at least one research paper
3. Seminar topics should not be repeated in the department and registration of the same should be done on a first come first served basis.
4. Seminar report should be submitted in paper-bound copy prepared with computer typing
 - a). The size of the report depends on the advancement of the topic.
 - b). Students should preferably refer minimum of 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.

POORNIMA UNIVERSITY, JAIPUR									
Faculty of Engineering and Technology									
Name of Program: B.Tech. in Electrical and Computer Engineering					Duration: 4 Years				
Teaching Scheme for Batch 2024-28									
Semester-VIII									
Course Code	Name of Course	Teaching Scheme			SH	Marks			Credits
		Lecture (L)	Tutorial (T)	Practical (P)		IE	ESE	Total	
A.		Major (Core Courses)							
A.1	Theory								
BERCEE8101	Power System Restructuring and	3	0	0		40	60	100	3
BERCEE8102	Digital Image Processing	3	0	0		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
BERCEE8203	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 Control								
BERECE8113	Cryptography and Network Security								
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					22
Total Teaching Hours		30/30							

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 THE COURSE

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
	<ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> □ Conclusion and Summary of Unit
2.	Sensing, Measurement, Control and Automation

	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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/			

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

- C01** To understand the fundamentals and representation of digital image.
- C02** To analyze the processing of color image.
- C03** To recognize the segments in image.
To demonstrate the ideas of Image Segmentation
- C04**
- C05** To relate and recognize the various objects in an image.

A. OUTLINE OF THE COURSE

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
	<ul style="list-style-type: none"> • Introduction of Unit • Digital Image Fundamentals, Human visual system, Image as a 2D data • 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 • Filtering in the Frequency Domain: Preliminary Concepts, Extension of functions of two variables, Image Smoothing, Image Sharpening, Homomorphic filtering • Conclusion of Unit including real life applications
2.	Image Restoration and Reconstruction
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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 Anil K	Latest	Prentice Hall India
3.	Image Processing, Analysis and Machine Vision	Milan Sonka, Vaclav Hlavav, Roger Boyle	Latest	Thomson Learning
4.	Digital Image Processing	Pratt W.K	Latest	John Wiley & Sons
Websites				
<ul style="list-style-type: none"> □ https://nptel.ac.in/courses/108101039/ □ https://nptel.ac.in/content/storage2/courses/108101039/download/Lecture-1.pdf 				

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 THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction and Classification
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • Introduction of Unit • Introduction to geometric, dynamic and integer programming and genetic algorithms. • Application of Geometric Programming: • Engineering problems with degree of difficulty equal to zero or one with constraints. • Conclusion and Summary of Unit
5.	Applications of Optimization
	<ul style="list-style-type: none"> • Introduction of Unit • Optimization of staged and discrete processes. • Engineering Optimization problems and solutions. • Conclusion and Summary of Unit

C. RECOMMENDED STUDY MATERIAL:

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

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 THE COURSE

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. DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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

	<ul style="list-style-type: none"> ▪ 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
	<ul style="list-style-type: none"> • 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
	<ul style="list-style-type: none"> • 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 STUDY MATERIAL:

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			
<ul style="list-style-type: none"> □ https://nptel.ac.in/courses/108101040/ □ https://nptel.ac.in/content/syllabus_pdf/108104052.pdf 			

Code: **BERECE8113**

Cryptography and Network Security 3 Credits [LTP: 3-0-0]

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

- **CO1 - Understand:** Understand the foundational concepts of cryptography, including security attacks, conventional and modern block ciphers, and their cryptanalysis.
- **CO2 - Apply:** Apply concepts of confidentiality and modular arithmetic, including conventional encryption, key distribution, and the use of mathematical theorems in cryptography.
- **CO3 - Analyze:** Analyze the principles and algorithms of public key cryptography, including RSA, Diffie-Hellman, and Elliptic curve cryptography, and their applications in authentication.
- **CO4 - Create:** Create and evaluate integrity checks and authentication algorithms using MD5, SHA, and digital signatures, and implement authentication protocols and email security mechanisms.
- **CO5 - Evaluate:** Evaluate the architecture and mechanisms of IP security, including the use of authentication headers, encapsulating security payloads, and key management techniques.

D. OUTLINE OF THE COURSE

Unit No.	Title of the unit	Time required for the Unit(Hours)
1.	Introduction to Cryptography and Block Ciphers	9
2.	Confidentiality and Modular Arithmetic	8
3.	Public key cryptography and Authentication requirements	9
4.	Integrity checks and Authentication algorithms	8
5.	IP Security and Key Management	8

E. DETAILED SYLLABUS

Unit	Unit Details
1.	Introduction to Cryptography and Block Ciphers
	<ul style="list-style-type: none">• Introduction of Unit• Introduction to security attacks - services and mechanism - introduction to cryptography Conventional Encryption: Conventional encryption model - classical encryption techniques substitution ciphers and transposition ciphers – cryptanalysis – steganography - stream and block ciphers - Modern Block Ciphers: Block ciphers principals - Shannon's theory of confusion and diffusion - feistel structure - data encryption standard(DES) - strength of DES - differential and linear crypt analysis of DES - block cipher modes of operations - triple DES – AES Conclusion and Summary of Unit
2.	Confidentiality and Modular Arithmetic

	<ul style="list-style-type: none"> • Introduction of Unit • Confidentiality using conventional encryption - traffic confidentiality - key distribution - random number generation - Introduction to graph - ring and field - prime and relative prime numbers - modular arithmetic - Fermat's and Euler's theorem - primality testing - Euclid's Algorithm - Chinese Remainder theorem - discrete algorithms. • Conclusion and Summary of Unit
3.	Public key cryptography and Authentication requirements
	<ul style="list-style-type: none"> ▪ Introduction of Unit ▪ Principles of public key crypto systems - RSA algorithm - security of RSA - key management – Diffie-Hellman key exchange algorithm - introductory idea of Elliptic curve cryptography – Elgamel encryption - Message Authentication and Hash Function: Authentication requirements - authentication functions - message authentication code - hash functions - birthday attacks – security of hash functions and MACS. ○ ▪ Conclusion and Summary of Unit
4.	Integrity checks and Authentication algorithms
	<ul style="list-style-type: none"> • Introduction of Unit • MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - Authentication Applications: Kerberos and X.509 - directory authentication service - electronic mail security-pretty good privacy (PGP) - S/MIME. Conclusion of Unit including real life application
5.	IP Security and Key Management
	<ul style="list-style-type: none"> • Introduction of Unit • IP Security: Architecture - Authentication header - Encapsulating security payloads - combining security associations - key management. • Conclusion and Summary of Unit

F. RECOMMENDED STUDYMATERIAL:

Sr. No	Reference Book	Author	Publication
1	Cryptography and Network Security: Principles and Practice	William Stallings	Pearson Education
2	Applied Cryptography: Protocols, Algorithms, and Source Code in C	Bruce Schneier	John Wiley & Sons
3	Understanding Cryptography: A Textbook for Students and Practitioners	Christof Paar, Jan Pelzl	Springer
4	Cryptography and Network Security	Behrouz A. Forouzan, Debdeep Mukhopadhyay	McGraw-Hill Education
5	Modern Cryptography: Theory and Practice	Wenbo Mao	Prentice Hall

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 OF EXPERIMENTS

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 in 1kWp Solar PV system”.
4.	Experiment on Performance assessment of Grid connected and Standalone 1kWp 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.

Code: BERCCE8203

COMPUTER VISION LAB

2 Credits [LTP: 0-0-2]

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

- **CO1 - Understand:** Understand image assessment techniques using NumPy and OpenCV for effective image manipulation and analysis.
- **CO2 - Apply:** Apply image transformation techniques in OpenCV to modify and enhance visual data.
- **CO3 - Analyze:** Analyze various feature detection methods in OpenCV, including corner, edge, and pyramid detection, to extract meaningful information from images.
- **CO4 - Evaluate:** Evaluate and implement image denoising and enhancement techniques to improve image quality.
- **CO5 - Create:** Create and develop solutions for object detection and tracking, pattern recognition, face recognition, and motion analysis using OpenCV.

LIST OF EXPERIMENTS

1.	Image assessment with NumPy and OpenCV
2.	Image Transformation in OpenCV
3.	Feature Detection using OpenCV- Corner, Edge, Pyramid
4.	Image Denoising and enhancement techniques
5.	Object Detection
6.	Basic Video Processing in OpenCV
7.	Object Tracking
8.	Pattern Recognition
9.	Face Recognition
10.	Motion analysis and Action detection
11.	Project Based Learning

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

CO	Course Outcomes	Bloom Level
CO – 01	Understand the theoretical foundations and practical applications related to the chosen topic within civil engineering.	L2
CO – 02	Apply theoretical concepts and engineering principles to develop solutions or designs for real-world civil engineering problems	L3
CO – 03	Evaluate the feasibility, sustainability, and effectiveness of the proposed solutions, identifying strengths, weaknesses, and potential improvements	L4
CO – 04	Solve complex engineering problems within the project's scope by applying creative and innovative approaches	L5
CO – 05	Implement the proposed solutions or designs in a practical context, considering real-world constraints, sustainability, and ethical considerations	L6

GUIDE LINES:

9. The Project group in seventh term will continue the project work in eighth term and complete project in all respect (assembly, testing, fabrication, tabulation, test result etc.)
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 eighth term or before the last day of the eighth 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.

C. COs AND POs MAPPING

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

D. COs AND PSOs MAPPING

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

END
