Bapatla Engineering College

(*Autonomous*)
BAPATLA

ACADEMIC RULES & REGULATIONS
(R-18 REGULATIONS)
(w.e.f 2018-2019)
Four Years B.Tech. Syllabi

Bapatla Engineering College:: Bapatla

(Autonomous under Acharya Nagarjuna University)
(Sponsored by Bapatla Education Society)
BAPATLA-522102, Guntur District, A.P.

www.becbapatla.ac.in

Bapatla Engineering College :: Bapatla

(Autonomous)

Department of Electrical and Electronics Engineering

COURSE STRUCTURE

AND

SYLLABUS FOR 1st, 2nd, 3rd & 4th YEAR

B.TECH

Bapatla Engineering College :: Bapatla

(Autonomous)

Vision of the Institute

To build centers of excellence, impart high quality education and instill high standards of ethics and professionalism through strategic efforts of our dedicated staff, which allows the college to effectively adapt to the ever-changing aspects of education.

To empower the faculty and students with the knowledge, skills and innovative thinking to facilitate discovery in numerous existing and yet to be discovered the fields of engineering, technology and inter-disciplinary endeavors.

Mission of the Institute

To impart the quality education at par with global standards to the students from all over India and in particular those from the local and rural areas.

To maintain high standards so as to make them technologically competent and ethically strong individuals who shall be able to improve the quality of life and economy of our country.

Vision of the Department

The Department of Electrical & Electronics Engineering provides programs of the highest quality to produce globally competent technocrats who can address challenges of the millennium to achieve sustainable socio - economic development.

Mission of the Department

1. To provide quality teaching blended with practical skills.
2. To prepare the students ethically strong and technologically competent in the field of Electrical and Electronics Engineering.
3. To motivate the faculty and students in the direction of research and focus to fulfill social needs.

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Academic Rules & Regulations for B. Tech Program

(Approved by Academic Council & Governing Body of the College held on August 2018)

(Amended in August 2019; Effective for students admitted into First year B.Tech from the academic year 2018-2019 onwards – R18 Regulations).

1.0 EXTENT: All the rules and regulations, specified herein after, shall be read as a whole for the purpose of interpretation and when a doubt arises, the interpretation of the Chairman, Academic Council, Bapatla Engineering College (Autonomous) is final. As per the requirements of the Statutory Bodies, The Principal, Bapatla Engineering College (Autonomous), shall be the Chairman of the College Academic Council.

1.1DURATION OF THE PROGRAMME AND MEDIUM OF INSTRUCTION: The duration of the B.Tech. Programme is for four academic years consisting of two semesters in each academic year. The medium of instruction and examinations is English.

2.0 ADMISSIONS:

2.1 Admission into the First year of any Four Year B.Tech. Programmes of study in Engineering: Admissions into the first year of B.Tech. Programme of Bapatla Engineering College (Autonomous) (***Subsequently referred to as*** **B.E.C**) will be as per the norms stipulated by the Govt. of Andhra Pradesh from time to time.

2.2 Admission into the Second year of any Four year B.Tech. Programmes of study in Engineering as Lateral Entry Student**:** Admissions into the second year of B.Tech. Programme of B.E.C will be as per the norms stipulated by the Govt. of Andhra Pradesh from time to time.

2.3 Admissions with advance standing: These may arise in the following cases:

1) When a student seeks transfer from other colleges to B.E.C and intends to pursue B.Tech at B.E.C in an eligible branch of study.
2) When students of B.E.C get transferred from one regulation to another regulation or from previous curriculum to revised curriculum.
3) When a student, after long discontinuity, rejoins the college to complete his/her Programme of study for the award of the degree.

These admissions may be permitted by the Academic Council of B.E.C as per the norms stipulated by the statutory bodies and the Govt. of Andhra Pradesh from time to time. In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained and the Programme of study at B.E.C will be governed by the transitory regulations stipulated in ***4.3.3 and 4.3.4.***

3.0 Details of the Program:

S.No	Activity	Description
1.	Number of Semesters in an Academic Year	Two
2.	Course Work	15 Weeks. 90 instructional days.
3.	Evaluation	As per the Assessment and Examination Policy.

4.0 Programmes of study in B.Tech:

4.1 The Four year B.TechProgramme is offered in the following branches of study:

S.No.	Title of the UG Programme	Abbreviation
1.	Civil Engineering	CE
2.	Computer Science & Engineering	CS
3.	Electrical & Electronics Engineering	EE
4.	Electronics & Communication Engineering	EC
5.	Electronics & Instrumentation Engineering	EI
6.	Information Technology	IT
7.	Mechanical Engineering	ME

4.2 Structure of the Programme:

As per the Program Review Policy & AICTE model curriculum guidelines.

4.3 **Transitory Regulations**: For students admitted under advance standing (mentioned in 2.3) these transitory regulations will provide the *modus operandi*.

At the time of such admission, based on the Programme pursued (case by case)

1) Equivalent courses completed by the student are established by the BOS concerned.
2) Marks/Credits are transferred for all such equivalent courses and treated as successfully cleared in the Programme of study prescribed by the concerned BOS.
3) A Programme chart of residual courses not cleared will be derived and a Programme of study with duration specified will be prescribed for pursuit at B.E.C.
4) Marks obtained in the previous system, if the case be, are converted to grades and CGPA is calculated accordingly.

All other modalities and regulations governing shall be the same as those applicable to the stream of students with whom such a candidate is included into.

4.4 Curriculum for each Programme of study:

1) The Four year curriculum of any B.TechProgramme of study in any branch of engineering is formulated based on the guidelines mentioned in 4.2 and will be recommended by the Board of Studies concerned and is approved by the Academic council of the college.
2) In the case of students admitted through lateral entry, the respective regular curriculum from the second year onwards is to be pursued by such students. Foundation courses may be added if necessary.
3) In the case of students admitted under advanced standing, the equivalency will be prepared by the Department Committee and to be approved by the Board of Studies concerned and the Academic Council.
4) After approval from the Academic Council, Department informs the courses to be taken by all the students along with the academic regulations.

The following Table-I below shows a curriculum frame work for four year B.Tech Degree program.

Table-I

S. No	Category	R18 credits	AICTE Proposed credits	APSCHE Proposed credits
1	Humanities & Social Science including Management Courses	12	12	13
2	Basic Science Courses	25	26	24
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	26	20	24
4	Professional Core Courses	68	53	62
5	Departmental Elective Courses	15	18	12
6	Institutional Elective Courses	06	18	12
7	Project work, seminar and internship in industry or elsewhere	12	11	13
8	Industry Internship	2	non-credit courses	non-credit courses
9	MOOCs	2	non-credit courses	non-credit courses
10	Mandatory Courses [Indian Constitution, Essence of Indian Traditional Knowledge etc]	non-credit courses	non-credit courses	non-credit courses
Total credits		168	158	160

*For mandatory courses as suggested by UGC / AICTE no credits are allocated but obtaining pass grade in these subjects is compulsory to obtain degree.
The students admitted through the **Lateral Entry scheme** have to complete **134** credits.

The following table–II shows below classification of Humanities & Social Science including Management Courses

Table-II

S.No	Subject	No.of Credits
1	Communicative English	02
2	Technical English	02
3	Professional Ethics and Human values	03
4	Industrial Management and Entrepreneurship Development	03
5	English Communication skills Lab	01
6	Soft skills lab	01
Total Credits		12

The following table –III shows below classification of Basic Science Courses

Table-III

S.No	Subject	No.of Credits
1	Mathematics – I (Linear algebra and differential equations)	03
2	Physics – I Waves and Modern Physics	04
3	Mathematics – II (Numerical methods& Advanced Calculus)	03
4	Chemistry	03
5	Physics – II (Semiconductor Physics and Nano Materials)	03
6	Mathematics – III (Probability and Statistics)	03
7	Environmental Studies	02
8	Biology for Engineers	02
9	Physics Lab	01
10	Chemistry Lab	01
Total Credits		25

The following table –IV shows below classification of Engineering Science Courses

Table-IV

S.No	Subject	No.of Credits
1	Engineering Graphics	03
2	Circuit Theory	03
3	Programming for Problem Solving	02
4	Digital Electronics	04

5	Analog Electronics	03
6	Engineering Mechanics	04
7	Workshop Practice Lab	01
8	Digital Electronics Lab	01
9	Chemistry Lab	01
10	Circuit Theory Lab	01
11	Programming for Problem Solving Lab	01
12	Analog Electronics Lab	01
13	Data Structures and Algorithms Lab	01
Total Credits		26

The following table –V shows below classification of Professional Core Courses

Table-V

S.No	Subject	No.of Credits
1	Network Analysis	04
2	Electrical Machines-I (DC Machines and Transformers)	04
3	Electro Magnetic Fields	03
4	Electrical Machines-II (Induction motors and Synchronous machines)	04
5	Signals & Systems	03
6	Power Systems- I	03
7	Power System – II	04
8	Control Systems	04
9	Power Electronics	04
10	Microprocessors & Microcontrollers	03
11	AI Techniques in Electrical Engineering	03
12	Power System Protection	04
13	Electrical Drives	03
14	IOT's in Electrical Engineering	03
15	Power System Operation Control	04
16	High Voltage Engineering	03
17	Measurement and Instrumentation Lab	02
18	Electrical Machines Lab-I	01
19	Microprocessors & Microcontrollers Lab	01
20	Electrical Machines Lab-II	01
21	Control System Lab	01
22	Power Electronics lab	01
23	Simulation Lab	01
24	Power Systems Lab -I	01
25	Electronics Design Lab	02
26	Power Systems Lab -II	01
Total Credits		68

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The following table –VI shows below classification of Departmental Elective Courses

Table-VI

S.No	Subject	No.of Credits
	Departmental Elective-I	
01	Optimization techniques	03
02	Electrical Energy Conservation & Auditing	
03	Power Distribution System	
04	Digital Signal Processing	
	Departmental Elective-II	
05	Electrical Machine Design	03
06	Control Systems Design	
07	Switched mode power supply	
08	Digital Protection of Power System	
	Departmental Elective-III	
09	HVDC & FACTS Controllers	03
10	Electrical and Hybrid Vehicles	
11	Line Commutated and Active Rectifiers	
12	Computer Aided Power System	
	Departmental Elective-IV	
13	Power Quality	03
14	Smart Grid Technology and Applications	
15	Machine Modelling and Analysis	
16	Advanced Electric Drives	
	Departmental Elective-V	
17	Energy Storage Systems	03
18	Industrial Electrical Systems	
19	Digital Control Systems	
20	Wavelet Transforms	
Total Credits		15

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The following table –VII shows below classification of Institutional Elective Courses

Table-VII

S.No	Subject	No.of Credits
Institutional Elective Courses-I		
1	Air Pollution & Control	03
2	Sustainable Water and Sanitation	
3	Java Programming	
4	Database Management Systems	
5	Consumer Electronics	
6	Embedded Systems	
7	Principles & Applications of MEMS	
8	Power System Instrumentation	
9	Data Analytics	
10	Cyber Security	
11	Fluid Power and Control Systems	
12	Project Management	
13	Linear Algebra	
14	Nano-Materials and Technology	
15	Fiber Optic Communication	
16	System Thinking	
17	English for Competitive Examinations	
18	Professional Communication	
Institutional Elective Courses-II		
19	Disaster Management	03
20	Remote sensing & GIS	
21	Python Programming	
22	Computer Networks	
23	Artificial Neural Network	
24	Internet of Things (IoT)	
25	Robotics and Automation	
26	Advanced Computer Control Systems	
27	Mobile Application Developments	
28	Web Technology	
29	Non-Conventional Energy Sources	
30	Automobile Engineering	
31	Graph Theory	
32	Advanced Materials	
33	Optical Electronics	
34	Organizational Psychology	
35	Telugu Modern Literature	
36	English Through Media	
Total Credits		06

4.5 The Maximum duration permitted to pursue the programme and cancellation of admission:

4.5.1 The maximum duration permitted for any student to successfully complete any four year B.Tech. Programme of study shall be:

1) Eight academic years in sequence from the year of admission for a normal student admitted into the first year of any Programme,
2) Six academic years in sequence from the year of admission for a Lateral entry student admitted into the second year of any Programme, and
3) For students admitted with advanced standing, the maximum time for completion of Programme study shall be twice the period in terms of academic years in sequence, stipulated in the Programme curriculum defined at the time of admission.

4.5.2 In case, any student fails to meet the applicable conditions for the eligibility of degree in the maximum stipulated period as mentioned in ***4.5.1***, his/her admission stands cancelled and no degree will be awarded.

5.0 EXAMINATION& EVALUATION:

The performance of the students in each semester shall be assessed course wise. All assessments will be done on absolute mark basis. However, for the purpose of reporting the performance of a candidate, letter grades and grade points will be awarded as per section ***9.1.***

EVALUATION:

The performance of the students in each semester shall be assessed course wise. All assessments will be done on absolute mark basis. However, for the purpose of reporting the performance of a candidate, letter grades and grade points will be awarded. The performance of a student in each course is assessed with alternate assessment methods, term examinations on a continuous basis during the semester called Continuous Internal Evaluation (CIE) and a Semester End Examination (SEE) conducted at the end of the semester. For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester, except where stated otherwise in the detailed Scheme of Instruction.

The distribution of marks between Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) to be conducted at the end of the semester will be as follows:

Nature of the Course	**CIE**	**SEE**
Theory subjects	50	50
Drawing	50	50
Practical	50	50
Term Paper	50	50
Project work	75	75

5.1 Continuous Internal Evaluation (CIE) in Theory and Drawing subjects:

In each Semester there shall be two Term examinations and some***Alternate Assessment Tools (AAT)*** like Home Assignment, Class Test, Problem Solving, Group Discussion, Quiz, Seminar and Field Study in

every theory course. The Alternate Assessment Tools with detailed modality of evaluation for each course shall be finalized by the teacher concerned before beginning of the course. It will be reviewed and approved by the Department Committee.

The Term Examination is conducted in the regular mode according to a schedule which will be common for a particular year of study. The maximum weightage for Term Examinations, AATs and the calculation of marks for CIE in a theory course is given in the following table.

Particulars	Term Exams (Max. 20 marks)	AAT (Max. 30 marks)
Better Performed exam	75% of marks obtained	Continuous assessment by teacher as per the predetermined course delivery & assessment plan. (Min. two assessments)
Other exam	25% of marks obtained	

A minimum of 25 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in that course and eligible to write the SEE of that course.

Semester End Examination (SEE) in Theory, Design and/or Drawing course:

a) For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester for 50marks, except where stated otherwise in the detailed Scheme of Instruction. Question paper setting shall be set by the teacher or teachers together in a multi section courses and to be verified as described in policy document.

b) A minimum of 20(40%) marks are to be secured exclusively in the Semester End Examination (SEE) of theory, design and/or drawing course in order to be declared as passed in that course and for the award of the grade in the course.

5.3 Continuous Internal Evaluation (CIE) in laboratory courses:

The evaluation for Laboratory course is based on CIE and SEE. The CIE for 50 marks comprises of 20 marks for day to day laboratory work, 15 marks for record submission and 15 marks for a laboratory examination at the end of the semester.

In any semester, a minimum of 90 percent of prescribed number of experiments / exercises specified in the syllabi for laboratory course shall be taken up by the students. They shall complete these experiments / exercises in all respects and get the record certified by the internal lab teacher concerned and the Head of the Department concerned to be eligible to appear for the Final Examination in that laboratory course.

A minimum of 25 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in that lab course and eligible to write the SEE of that lab course.

5.4 Semester End Examination (SEE) in laboratory courses:

a) For each laboratory course, the Semester End Examination (SEE) shall be conducted by one internal and one external examiner appointed by the Principal and the duration of the exam shall be for three hours. The SEE is for 50 marks which include 10 marks for write up, 20 marks for lab experiment/exercise, 15 marks for Viva-voce and 5 marks for general impression.

b) A minimum of 20 (40%) marks shall be obtained in SEE of a laboratory course in order to be declared as passed and for the award of the grade in that laboratory course.

5.5 Evaluation of Term Paper:

a) A term paper is to be submitted by each student in the 7th semester which would be a precursor to the project work to be done in the 8th semester. The evaluation is based on CIE for 50 marks, which includes a minimum of two seminars/presentations for 20 marks and the report submitted at the end of the semester which is evaluated for 30 marks.

b) A minimum of 25 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in the Term Paper and eligible to write the SEE in the Term Paper.

c) The Semester End Examination (SEE) shall be conducted for 50 marks by one internal and one external examiner appointed by the Principal. The SEE contains Viva-voce and the demonstration of the model developed or work performed as a part of the term paper.

d) A minimum of 20 (40%) marks shall be obtained in SEE of the term paper in order to be declared as passed and for the award of the grade in the term paper.

5.6 Evaluation of the Project

a) In case of the Project work, the evaluation shall be based on CIE and SEE. The CIE for 50 marks consists of a minimum of two Seminars / presentations for 20 marks and the Project Report submitted at the end of the semester which is evaluated for 30 marks.

b) A minimum of 25 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in the Project Work and eligible to write the SEE in the Project Work.

c) SEE shall be evaluated in the form of a Viva- voce and the demonstration of the thesis work for 100 marks. Viva-voce Examination in Project Work shall be conducted by one internal examiner and one external examiner to be appointed by the Principal.

d) A minimum of 40 marks shall be obtained in SEE exclusively in order to be declared as passed in the Project and for the award of the grade.

NOTE : A student who is absent for any Test / Exam / Seminar / Presentation as a part of Continuous Internal Evaluation (CIE), for any reason whatsoever, shall be deemed to have scored zero marks in the

respective component and no provision for make-up shall be provided.

5.7 Course Repetition (Repeater course)

The students not qualified to write SEE in a course may register for the repeater courses through course repetition and summer semester. The students have to apply to the Principal through the respective HOD by paying prescribed fees.

Course repetition: A student can take up a maximum of two theory courses in a semester immediately after the semester end examinations of that particular semester in accordance with the guidelines recommended by the Academic Council. The students who are not taking regular semester courses may additionally register for one more theory course.

Summer semester: Further the students can register maximum three (theory + lab courses together) courses in the summer semester. Summer semester courses shall be of both even & odd semesters. Summer semester shall be conducted immediately after completion of even semester end examinations.

The HODs concerned have to allot a teacher related to that course to conduct class work. The minimum number of periods to be conducted should not be less than 75% of the total prescribed periods for that course. The classes will be conducted in the vacation period or in the weekends or in the afternoons as decided by the HOD concerned. Teacher has to evaluate the student for his performance in CIE as per the autonomous norms and the qualified students should appear for a semester end examination. The pass criteria in both CIE & SEE should be as per autonomous norms.

The documents for monitoring the candidates registered for course repetition are available with the Heads of the Departments and Exam Section.

6.0 ATTENDANCE REGULATIONS:

All students shall maintain a minimum attendance of 75% in each course registered. The attendance percentage is computed by considering total number of periods conducted in a course as the denominator and the total number of periods actually attended by the student in that course, as the numerator.

In case of shortfall in this, the Principal of the College shall consider and may condone deficiency up to a limit of 10% in special cases for reasons such as medical emergencies, participation in sport, cultural activities, seminars, workshops and paper presentation etc. at the level of University, State, and National after due recommendation by the concerned Head of the Department.

For the above cases student must take prior permission from the head of the department to participate in such events and in case of medical emergencies intimation should be given immediately and submit the medical certificate to the concerned Head of the Department. Any student failing to meet the above standard of attendance in any course(s) registered, shall not be allowed to appear for SEE of such course(s). The student seeking condonence of attendance on the above grounds has to pay the condonence fee as specified by the college.

Further a student, who could not satisfy the minimum attendance of average 75% in all the courses put together (or 65% in special cases as mentioned above) in any semester, is not eligible to appear for the Semester End examinations and shall have to repeat that semester in the subsequent year.

6.1 Attendance at CIE and SEE: Attendance at all examinations, both CIE and SEE of each course registered shall be compulsory for the students and there shall not be any provision for re-examinations/consideration.

6.2 Any student against whom any disciplinary action by the College is imposed shall not be permitted to attend any SEE in that Semester.

6.3 The basis for the calculation of the attendance shall be the period prescribed by the College by its calendar of events. For the first semester students, the same is reckoned from the date of admission to the course.

6.4 The students shall be informed about their attendance position periodically by the College so that the students can strive to make up the shortage. However, non-receipt of such information from the college will not be considered as valid reason for exemption from the attendance requirements.

6.5 If a student does not fulfil the attendance requirements in any subject, he/she is not permitted to attend the Semester End Examination in that subject and is deemed to have been awarded "F' grade in that subject.

7.0 DETENTION: A student is said to have been detained and not allowed to appear for Semester End Examination (SEE) at the end of the semester when

7.1 The student does not have a minimum average 75% attendance or 65% attendance with condonation in all subjects put together in that semester.

7.2 Such a student shall have to repeat the same semester subsequently and satisfy the above requirements afresh to become eligible to appear for the Semester End Examination (SEE), conducted at the end of the semester.

8.0 CONDITIONS FOR PROMOTION:

8.1 A student not detained in the first semester of a year of study shall be promoted to second semester of that year of study.

8.2 A student shall be eligible for promotion to III semester of B.Tech. Programme, if he/she is not detained in the second semester (of first year B.Tech. Programme) irrespective of the number of backlog courses (in terms of credits not earned) in I year B.Tech. (i.e. I & II semesters together).

8.3 A student shall be eligible for promotion to V semster of B.Tech. Programme, if he/she is not detained in the IV semesterand also must secure 50% of the credits of the subjects (including laboratory courses, MOOC courses etc as per curriculum) that have been studied in I & II semesters irrespective of whether the candidate takes the end examination or not as per the normal course of study. At the time of commencement of class work for the V semester, student must secure the required credits.

8.4 A student shall be eligible for promotion to VII semester of B.Tech. Programme, if he/she is not detained in the VI semester of B.Tech. Programme and also must secure 50% of the credits of the subjects (including laboratory courses, MOOC courses etc as per curriculum) that have been studied uptoIV semester. At the time of commencement of class work for the VII semester, student must secure the required credits.

And in case of getting detained for shortage of earned credits as per above, the student may make up the credits through supplementary exams for the failed courses before the date of commencement of class work for V or VII semester respectively.

7.0 Reregistration of not qualified courses in CIE for lack of attendance or lack of marks:

Students who failed to secure minimum attendance (75%) and minimum percentage of marks (50%) in CIE specified in any course, he / she will not be allowed to write SEE of that course. Such students have to register and qualify in CIE for those courses through course repletion and summer semester.

Students, who failed after final regular examination (SEE), must appear for the supplementary examinations to be conducted as per the college examination schedule.

Registration: Every eligible student has to register himself / herself at the beginning of every semester indicating all the Courses taken up for pursuit by him / her during that Semester and mentor's signature is mandatory.

8.1 When a student is debarred for one or more semesters, his / her registration in the present semester is cancelled and the student is debarred from registering in future during the debarred period.

8.2 In any case, while re-registering in any semester, he or she will have to pay the requisite fee once again.

For extended years of study, students must pay the tuition fees as per the college regulations.

9.0 GRADING SYSTEM

Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester for each course.

Letter Grades: A letter grade is basically a qualitative measure (an alphabet/letter) giving the performance of a student, such as,

Performance	**Grade**
Extraordinary	A+
Excellent	A
Very Good	B+
Good	B

Average	C
Pass	P
Unsatisfactory/Fail	F

The above grades are based on the marks obtained by the student in both CIE and SEE.

9.1 Grade Points

Depending on the letter grades assigned, a student earns certain grade points. The Colleges follow the 10-point grading system, as given below for absolute grading system.

The letter grades and the corresponding grade points are as given in the Table.

Table: Grades & Grade Points

Grade	Grade Points	% of Marks
A+	10	≥90% – 100%
A	9	≥80% –< 90%
B+	8	≥70% – <80%
B	7	≥60% – <70%
C	6	≥50% –< 60%
P	5	≥45% – <50%
F(Fail)	0	< 45%

9.1.1 The grade points given in above tables help in the evaluation of credit points earned by the student in a Course as the credit points are equal to the number of credits assigned to the Course multiplied by the grade points awarded to the student in that Course. This shall be used in arriving at the Semester Grade Point Average (SGPA) of the student for that semester, as it is the sum of all the credit points earned by the student for all the Courses registered in that semester.

9.1.2 Earning of Credit: A student shall be considered to have completed a Course successfully and earned the credits if he/she secures an acceptable letter grade in the range A+ to P. Letter grade 'F' in any Course implies failure of the student in that Course and no credits earned.

9.2 A student who earns a minimum of 5 grade points (P grade) in a course is declared to have successfully completed the course, and is deemed to have earned the credits assigned to that course.

However it should be noted that a pass in any course/term paper/Project shall be governed by

the rules mentioned Assessment and Examination Policy.

10.0 GRADE POINT AVERAGE

10.1 The Grade Point Average (GPA) will be calculated according to the formula:

$$GPA = \frac{\sum C_i G_i}{\sum C_i}$$

Where C_i = number of credits for the course *i*,

G_i = grade points obtained by the student in the course.

10.2 Semester Grade Point Average (SGPA) is awarded to candidates considering all the courses of the semester. Zero grade points are also included in this computation.

10.3 To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student's performance in all the courses taken in all the semesters completed up to that particular point of time.

10.4 Example

Semester	Course Code.	Credits	Grade	Grade Point	Credit Points	SGPA	CGPA
III	18EC301	3	C	6	18	**6.72 (148/22)**	**6.72 (148/22)**
III	18EC302	3	B	7	21		
III	18EC303	3	A	9	27		
III	18EC304	4	P	5	20		
III	18EC305	4	C	6	24		
III	18EC306	2	B+	8	16		
III	18ECL301	1	P	5	5		
III	18ECL302	1	B	7	7		
III	18ECL303	1	A+	10	10		
Total		**22**			**148**		
IV	18EC401	3	P	5	15	**7.40 (163/22)**	**7.06 (311/44)**
IV	18EC402	3	B	7	21		
IV	18EC403	4	A+	10	40		
IV	18EC404	4	C	6	24		
IV	18EC405	2	A	9	18		
IV	18EC406	3	B+	8	24		
IV	18ECL401	1	P	5	5		

IV	18ECL402	1	C	6	6	
IV	18ECL403	1	A+	10	10	
Total		**22**			**163**	

11.0 ELIGIBILITY FOR AWARD OF B.TECH. DEGREE: A student shall be eligible for award of the B.Tech degree if he/she fulfils all the following conditions:

1) Registered and successfully completed all the components prescribed in the Programme of study to which he/she is admitted
2) Obtained CGPA greater than or equal to 6.0 (Minimum requirements for Pass)
3) Has no dues to the Institute, hostels, Libraries, NCC/NSS etc., and
4) No disciplinary action is pending against him/her

12.0 AWARD OF CLASS: A candidate who becomes eligible for the award of B.Tech. Degree shall be placed in one of the following Classes based on CGPA.

Table: CGPA required for award of Degree

Distinction	**≥ 8.0***
First Class	**≥ 6.5 < 8.0**
Second Class	**≥ 5.5 < 6.5**
Pass Class	**< 5.5**

* In addition to the required CGPA of 8.0, the student must have necessarily passed all the courses of every semester **in the minimum stipulated period for the Programme**.

If the student did not obtain a CGPA of 6.0 after completing all courses of study, he/she should repeat some courses and obtain higher grade till his/her CGPA is 6.0. Unless he/she obtains a CGPA of 6.0, degree will not be awarded.

12.1 Grade Sheet: A grade sheet (Memorandum) will be issued to each student indicating his performance in all courses taken in that semester and also indicating the Grades and SGPA.

12.2 Transcripts: After successful completion of the total Programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee. Partial transcript will also be issued up to any point of study to any student on request and by paying the stipulated fee in force.

12.3 The Academic council of the College approves and recommends the same to AcharyaNagarjuna University for the award of a degree to any student.

13.0 IMPROVEMENT OF CLASS:

13.1 A candidate, after becoming eligible for the award of the Degree, may reappear for the Final Examination in any of the theory courses as and when conducted, for the purpose of improving the class. But this reappearance shall be only once and within a period of two academic years after becoming eligible for the award of the Degree.
However, this facility shall not be availed by a candidate who has taken the Original Degree Certificate. Candidates shall not be permitted to reappear either for CIE in any course or for Semester End Examination (SEE) in laboratory courses (including Project Viva-voce) for the purpose of improvement.

14.0 SUPPLEMENTARY EXAMINATIONS: In addition to the Regular Final Examinations held at the end of each semester, Supplementary Final Examinations will be conducted during the academic year. Candidates taking the Regular / Supplementary examinations as Supplementary candidates may have to take more than one Final Examination per day.

15.0 INSTANT SUPPLEMENTARY EXAMINATIONS: Candidates who fail in one theory course of VIII semester can appear for Instant Supplementary Examination conducted after declaration of the revaluation results of the said exam.

16.0 MALPRACTICES:

The Principal shall refer the cases of malpractices in Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) to an Enquiry Committee constituted by him / her. The Committee will submit a report on the malpractice allegedly committed by the student to the Principal. The Principal along with the members of the Committee is authorized to award a punishment as per the norms, if the student is found guilty.

16.1 Toprevent the students indulging in Malpractices through latest electronic gadgets such as Cell-phones, Pagers, Organizer PDAs and Palmtops in addition to chits, printed material etc. in the examination halls, students shall be thoroughly checked at the main entrance as well as in the examination halls by the invigilators. The senior staff members appointed as internal flying squad has greater and decisive role to play in this regard.

16.2 A notice displaying the 'SCALE OF PUNISHMENT' shall prominently be displayed at the Main Entrance to the Examination Halls, preferably near the 'Seating Plan Display'.

16.3 If any student is found resorting to malpractice, the matter shall immediately be brought to the notice of Chief/Additional chief superintendent, Flying squad by the invigilator concerned.

16.4 The above staff members will then prepare a detailed report on the spot in proforma-I (copy enclosed) of the case. The full details of the offence and the details of supporting material must be written in establishing the case. The residential addresses of the students involved in malpractice shall be noted with contact telephone numbers in the malpractice report.

16.5 A written statement is to be obtained from the candidate. If any candidate refuses to give the written statement, the same shall be recorded by the invigilator with the signature of another invigilator as witness.

16.6 Whatever be the supporting material for establishing the case of malpractice, the same are to be confiscated immediately for sending the same to the Malpractices prosecuting committee as a

proof.

16.7 The supporting materials so confiscated shall be signed by the chief superintendent and flying squad/invigilator and shall be attached and tagged properly to the scripts of the malpractice cases and are to be sent toMalpractices prosecuting committeealong with the report (proforma enclosed).

16.8 Anyrepresentation to relax the punishment will not be entertained by Malpractices prosecuting committee.

16.9The answer scripts of the candidates who resorted to mal-practice shall be packed in a separate sealed cover duly subscribing on the cover as "MAL-PRACTICE" and send the same to Malpractices prosecuting committee.

16.10 Any student who is arrogant and does not follow the examination rules shall be sent out of the examination hall after collecting his question paper and answer book. Complaints on such cases shall be lodged to the Principal irrespective of imposter is an examinee or an outsider.

SCALE OF PUNISHMENT FOR MAL-PRACTICE CASES

Rule No.	Nature of Offence	Scale of Punishment
01	Writing unparliamentary / vulgar / obscene / words or Language in the answer book. OR Refusing to obey instructions of the Chief Superintendent / Invigilator.	The performance of the candidates in that subject shall be cancelled. Further the case should be referred to the disciplinary committee by Chief Superintendent / Malpractices prosecuting committee. If the student repeat the same offence, the performance of the candidate in the semester examination in ALL SUBJECTS (whole/part examination, as the case may be, including Practicals) shall be cancelled
02	A candidate found in possession of any relevant material pertaining to the day of examination such as Papers, Books, Notes OR Notes written on any part of the clothes dressed by the candidate or any part of his/her body or any part of Table or Desk; OR Foot rule, instruments like setsquare, protractor, calculator, mobile phones, etc., with notes written on them. OR Mass copying at the examination centre detected during the conduct of examination or during valuation.	The candidate is to be sent out of the examination hall immediately after obtaining his/her written explanation and duly confiscating his/her Hall-ticket. He/she shall be allowed to appear for the remaining subjects in that examination by obtaining duplicate hall ticket. The performance of the candidates in that subject shall be cancelled. Further depending on severity of offence or reoccurrence of the offence by the student, the Malpractices prosecuting committee may impose the cancellation of performance of the candidate in two or more or ALL SUBJECTS (whole/part examination, as the case may be, including Practicals) in that semester examination.
03	A candidate found having copied or indulging in copying from any	The candidate is to be sent out of the examination hall immediately after obtaining his/her written

	paper, book or notes or any other source or allowed or is found allowing any other candidate to copy any matter from his/her answer book or to have in any manner rendered any assistance to another candidate, or if he/she is found to have been receiving assistance from another candidate. OR Destruction or suppression of the evidence of the forbidden material in any way like swallowing, tearing or throwing outside etc.	explanation and duly confiscating his/her Hall-ticket. He/she shall be allowed to appear for the remaining subjects in that examination by obtaining duplicate hall ticket. The performance of the candidates in that subject shall be cancelled. Further depending on severity of offence or reoccurrence of the offence by the student, the Malpractices prosecuting committee may impose the cancellation of performance of the candidate in two or more or ALL SUBJECTS (whole/part examination, as the case may be, including Practicals) in that semester examination.
04	Copying detected on the basis of internal evidence such as during valuation/special scrutiny	The performance of the candidates in that subject shall be cancelled. Further depending on severity of offence or reoccurrence of the offence by the student, the Malpractices prosecuting committee may impose the cancellation of performance of the candidate in two or more or ALL SUBJECTS (whole/part examination, as the case may be, including Practicals) in that semester examination. Note for MPC: "The Malpractice Prosecuting Committee which awards the punishment to the candidates involved in the malpractice has to make sure of the involvement of the Candidate/s in the offence before any punishment is awarded to the candidate/s."
05	Throwing of Question paper after writing the answers on it to the other candidate(s) with the intention to help the other candidate(s). OR Throwing / Sending the Question paper/ questions contained in the question paper on any sheet/article out during the period of examination with an intention to receive assistance and caught by the Invigilator or by an Officer involved in the conduct of examinations	The candidate is to be sent out of the examination hall immediately after obtaining his/her written explanation and duly confiscating his/her Hall-ticket. He/she shall be allowed to appear for the remaining subjects in that examination by obtaining duplicate hall ticket. The performance of the candidates in that subject shall be cancelled. Further depending on severity of offence or reoccurrence of the offence by the student, the Malpractices prosecuting committee may impose the cancellation of performance of the candidate in two or more or ALL SUBJECTS (whole/part examination, as the case may be, including Practicals) in that semester examination.
06	Exchanging intentionally the answer scripts with a view to give or take help from another examinee.	The candidates (both who helps and who takes help) are to be sent out of the examination hall immediately after obtaining his/her written explanation and duly confiscating his/her Hall-ticket. The performance of all the candidates involved in the act in all subjects in that particular year/semester examination (whole/ part examination, as the case may be, including Practicals) shall be cancelled.

07	Taking away the answer book or leaving the examination hall without handing over the answer book to the Invigilating Staff whether returned Subsequently or tearing the answer Book.	The performance of the candidate in all subjects in that semester examination (whole/part examination, as the case may be, including Practicals) shall be cancelled and shall not be permitted to appear for whole/part examination, as the case may be, for next subsequent semester examinations.
08	Writing of answers in the answer book by his/her associates in the examination hall or at any other level.	The performance of all the candidates involved in the act in all subjects in that particular year/semester examination (whole/part examination, as the case may be, including Practicals) shall be cancelled and the candidates shall not be permitted to appear for TWO subsequent semesters examinations and they shall not be permitted to study the next higher class (debarred for one semester).
09	Obstructing the Chief Superintendent from performing his/her duties, abusing, threatening and showing disrespect towards Invigilator/ Chief Superintendent/ any other official connected with the conduct of examination within the institution premises.	The culprits are to be handed over to the Police immediately and a Criminal case is to be booked against them. The performance of the candidate in the particular year/ semester examination in ALL SUBJECTS (whole/part examination, as the case may be, including Practicals) shall be cancelled and the candidates shall not be permitted to appear for TWO subsequent semesters examinations and they shall not be permitted to study the next higher class (debarred for one semester).
10	Substitution of answer book. OR Insertion of drawing sheets or replacement of main answer book written outside with one written inside the examination hall.	The performance of the candidate in all subjects in that semester examination (whole/ part examination, as the case may be, including Practicals) shall be cancelled and the candidate shall not be permitted to appear for TWO subsequent examinations and he/she is not permitted to study next higher class (debarred for one semester).
11	Impersonation.	The performance of both the candidates, i.e., the impostor and the candidate, who is being impersonated, in all subjects in that semester examination (whole/ part examination, as the case may be, including Practicals) shall be cancelled and they are not permitted to study and appear for any examination for the next THREE semesters (including academic year in which the impersonation has taken place) in respect of either or both the candidates. A Criminal case may be lodged in the Police Station if the impostor is an outsider
12	Physical assault within the institution premises on personnel connected with the conduct of examinations.	The performance of the candidate in all the subjects in that semester examination (whole/part examination, as the case may be, including Practicals) shall be cancelled and the candidate shall not be permitted to appear for THREE subsequent examinations and he/she is not permitted to study next higher class (debarred for

		two semester), if any, till he/she completes the punishment period. A Criminal / Disciplinary case is to be booked against the culprits involved in the act.
13	Possession of blank main answer book/ additional answer book/ drawing sheet/ graph sheet which have not been issued in the Examination hall on the day of exam.	A Criminal / Disciplinary case is to be booked against the candidate. The matter should be brought to the notice of the authorities for initiation of appropriate action against all the guilty. The performance of the candidate in all subjects in that semester examination (whole/part examination, as the case may be, including Practicals) shall be cancelled.
14	Other offences, if any, not covered under the above provisions.	The Malpractice Prosecuting Committee shall make specific recommendations on the punishment to be awarded keeping in view the gravity of offence and also the scale of punishment, as above.

N O T E:

1. No re-examination shall be conducted, where candidates resort to boycott of examinations on any pretext.

2. In case a candidate resorting to malpractice by copying from any material in his/her possession and/or by any means is caught by the Flying Squad or Observers or any other Officer posted for duty for the examination, the explanation of the Invigilator in that particular hall of examination shall be called for, for not detecting the same and appropriate disciplinary action be initiated against him/her, after examining his/her explanation in the matter.

3. In all the malpractice cases the report made by the Invigilators should be thoroughly enquired into by the Chief Superintendent concerned and he/she should satisfy himself/herself with all the details in the Invigilators report and record the same in his/her report.

4. In cases where there is a laxity on the part of invigilators and chief superintendents and other officials connected with the conduct of examinations in the discharge of their duties properly, such as in cases where mass copying is reported in an examination hall or where the candidate involved in malpractice in an examination hall is booked by flying squad or others but not the invigilator, then appropriate disciplinary action should be taken against all the staff members involved, after giving them notice and considering their explanations, if any, offered.

5. Punishment for different offences committed in all cases and its duration is mentioned above. It is quite possible that in few cases, the punishment recommended to the candidates, may exceed, the validity of the Curriculum in existence. In such cases, the punishment period should be limited to that extent within which the candidate has to obtain his/her B.Tech. In certain cases, the candidate may not get any more chances to appear for examination and qualify for the award of B.Tech. The candidate will have to suffer the consequence for his/her misdemeanor.

6. In all cases of Malpractice, the hall ticket of the candidate is to be confiscated and shall be sent to the Malpractices prosecuting committee along with the answer script in separate cover. The candidate shall not be permitted to appear for the remaining subjects if any, in that examination.

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MAL-PRACTICE CASE REPORT

1. Examination Hall : _____

2. Date of Examination : _____

3. Time of Examination : _____

4.a) Course : _____

b) Year/Semester : _____

c) Scheme : _____

5. Subject in which candidate is booked:
a) Subject Code : _____

b) Subject : _____

6. Particulars of the candidate booked:
a) Regd. No. : _____

b) Name : _____

c) Residential address : _____

: _____

: _____

7. (a) Case booked by : Invigilator / Squad Members / Surprise Check Squad / Other Invigilator / Chief superintendent / Examination officers (Strike out whichever is not applicable)

(b) Name & Designation of the Staff who booked the case : _____

(c) Name & Designation of the : _____

Other invigilators in the Hall : _____

as witness. : _____

8. Give Full Details of the Offence : _____

_____

_____

_____

_____

_____

9. Give full details of Supporting material like Written Chits, Printed material, Mobile Phones, Books, Matter written on Scale, Calculator case etc., (matter should be related to the subject of examination on that day). If copied, the copied matter is to be marked in the supporting material and write Regd. No. of the candidate on the supporting material and should be sent to this office along with the answer booklet.

11. Signature of the Invigilator : _____
(whether the case is booked by him or by other officials)

12. Whether the student has given the statement or not ? : YES / NO

13. Signature of the candidate : _____

14. Remarks of the : _____

Chief Superintendent _____

_____

_____

SIGNATURE OF THE CHIEF SUPERINTENDENT

Encl: 1) Answer-script
2) Forbidden confiscated material
3) Statement of Student.

17.0 AMENDMENTS TO REGULATIONS:

The Academic Council of Bapatla Engineering College (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations, and/ or Syllabi or any other matter pertained that meets to the needs of the students, society and industrywithout any notice and the decision is final.

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

PEO1	To build a strong foundation in the principles of Basic Sciences, Mathematics and Engineering to solve real world problems encountered in modern electrical engineering and pursue higher

	studies/ placement/ research.
PEO2	To develop an integration of knowledge of various courses to design an innovative and cost effective product in the broader interests of the organization & society.
PEO3	To provide an ability to lead and work in their profession with multidisciplinary approach, cooperative attitude, effective communication and interpersonal skills by participating in team oriented and open ended activities.
PEO4	To integrate an ability to enhance career development, adapt to changing professional and societal needs by engaging in lifelong learning

PROGRAM OUTCOMES (PO'S)

Program Outcomes		**Engineering Graduates will be able to**
PO1	Engineering knowledge	Apply the knowledge of mathematics, science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	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.
PO3	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.
PO4	Conduct investigations of com plex 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.
PO5	Modern tool usage	Create, select, and apply appropriate techniques, Resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	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.
PO7	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.
PO8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and teamwork	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to com prehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11	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.
PO12	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

PROGRAM SPECIFIC OUTCOMES (PSO'S)

PSO1	Electrical and Electronics Engineering graduates will be able to apply the Knowledge of mathematics and sciences in modern power industry.
PSO2	Electrical and Electronics Engineering graduates will be able to analyze and design efficient systems to generate, transmit, distribute and utilize electrical energy to meet social needs using power electronic systems.
PSO3	Electrical and Electronics Engineering graduates will be able to apply principles of management and economics for providing better services to the society with the technical advancements in renewable and sustainable energy integration.

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Electrical and Electronics Engineering
Effective From the Academic Year2018-2019 (R18 Regulations)
First Year B.Tech (SEMESTER – I)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18MA001	Mathematics – I (Linear algebra and differential equations)	3	1	0	4	50	50	100	3
18PH001	Physics – I Waves and Modern Physics	4	1	0	5	50	50	100	4
18CE001	Environmental Studies	3	0	0	3	50	50	100	2
18EL001	Communicative English	3	0	0	3	50	50	100	2
18MEL01	Engineering Graphics	1	0	4	5	50	50	100	3
18PH L01	Physics Lab	0	0	3	3	50	50	100	1
18ELL01	English Communication skills Lab	0	0	3	3	50	50	100	1
18MEL02	Workshop Practice Lab	0	0	3	3	50	50	100	1
Induction program									
	TOTAL	**14**	**2**	**13**	**32**	**400**	**400**	**800**	**17**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Effective From the Academic Year2018-2019 (R18 Regulations)

First Year B.Tech(SEMESTER – II)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18MA002	Mathematics – II (Numerical methods& Advanced Calculus)	3	1	0	4	50	50	100	3
18CY001	Chemistry	4	0	0	4	50	50	100	3
18PH003	Physics – II (Semiconductor Physics and Nano Materials)	4	0	0	4	50	50	100	3
18EE204	Circuit Theory	4	0	0	4	50	50	100	3
18CS001	Programming for Problem Solving	3	0	0	3	50	50	100	2
18CY L01	Chemistry Lab	0	0	3	3	50	50	100	1
18EE L22	Circuit Theory Lab	0	0	3	3	50	50	100	1
18CS L01	Programming for Problem Solving Lab	0	0	3	3	50	50	100	1
NCC/NSS									
	TOTAL	**18**	**1**	**9**	**28**	**400**	**400**	**800**	**17**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Effective From the Academic Year2018-2019 (R18 Regulations)

Second Year B.Tech(SEMESTER – III)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18MA003	Mathematics – III (Probability and Statistics)	3	1	0	4	50	50	100	3
18EE302	Network Analysis	4	1	0	5	50	50	100	4
18EE303	Analog Electronics	4	0	0	4	50	50	100	3
18EE304	Electrical Machines-I (DC Machines and Transformers)	4	1	0	5	50	50	100	4
18CE003	Engineering Mechanics	4	1	0	5	50	50	100	4
18EL002	Technical English	3	0	0	3	50	50	100	2
18EEL31	Analog Electronics Lab	0	0	3	3	50	50	100	1
18EEL32	Measurement and Instrumentation Lab	2	0	3	5	50	50	100	2
	TOTAL	**24**	**4**	**6**	**34**	**400**	**400**	**800**	**23**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Electrical and Electronics Engineering
Effective From the Academic Year2018-2019 (R18 Regulations)
Second Year B.Tech (SEMESTER – IV)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18EE401	Electro Magnetic Fields	4	0	0	4	50	50	100	3
18EE402	Digital Electronics	4	1	0	5	50	50	100	4
18EE403	Electrical Machines-II (Induction motors and Synchronous machines)	4	1	0	5	50	50	100	4
18EE404	Signals & Systems	4	0	0	4	50	50	100	3
18CE002	Biology for Engineers	3	0	0	3	50	50	100	2
18EE406	Power Systems- I	4	0	0	4	50	50	100	3
18EEL41	Digital Electronics Lab	0	0	3	3	50	50	100	1
18EEL42	Electrical Machines Lab-I	0	0	3	3	50	50	100	1
18ITL01	Data Structures and Algorithms Lab	2	0	3	5	50	50	100	2
	TOTAL	**25**	**2**	**9**	**36**	**450**	**450**	**900**	**23**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Electrical and Electronics Engineering
Effective From the Academic Year2018-2019 (R18 Regulations)
Third Year B.Tech(SEMESTER – V)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18EE501	Power System – II	4	1	0	5	50	50	100	4
18EE502	Control Systems	4	1	0	5	50	50	100	4
18EE503	Power Electronics	4	1	0	5	50	50	100	4
18EE504	Microprocessors & Microcontrollers	4	0	0	4	50	50	100	3
18HS002	Indian Traditional Knowledge	3	0	0	3	50	50	100	0
18EE506	Professional Ethics and Human values	4	0	0	4	50	50	100	3
18EEL51	Electrical Machines Lab-II	0	0	3	3	50	50	100	1
18EEL52	Microprocessors & Microcontrollers Lab	0	0	3	3	50	50	100	1
18ELL02	Soft Skills Lab	0	0	3	3	50	50	100	1
18EEMO	MOOC								2
	TOTAL	**23**	**3**	**9**	**35**	**450**	**450**	**900**	**23**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Electrical and Electronics Engineering
Effective From the Academic Year2018-2019 (R18 Regulations)
Third Year B.Tech (SEMESTER – VI)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18EE601	AI techniques in Electrical Engineering	4	0	0	4	50	50	100	3
18EE602	Power System Protection	4	1	0	5	50	50	100	4
18EE603	Electrical Drives	4	0	0	4	50	50	100	3
18EE604	Applications of IOT in Electrical Engineering	3	0	3	6	50	50	100	3
18EE605	Power System Operation Control	4	1	0	5	50	50	100	4
18EED1__	Department Elective -I	4	0	0	4	50	50	100	3
18EEL61	Control System Lab	0	0	3	3	50	50	100	1
18EEL62	Power Electronics lab	0	0	3	3	50	50	100	1
18EEL63	Simulation Lab	0	0	3	3	50	50	100	1
	Internship	4 Weeks during Summer Vacation							
TOTAL		**23**	**2**	**12**	**35**	**450**	**450**	**900**	**23**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

Department Elective - I

18EED11: Optimization techniques
18EED12: Electrical Energy Conservation & Auditing
18EED13: Power Distribution System
18EED14: Digital Signal Processing

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Electrical and Electronics Engineering
Effective from the Academic Year2018-2019 (R18 Regulations)
Fourth Year B.Tech (SEMESTER – VII)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18EE701	High Voltage Engineering	4	0	0	4	50	50	100	3
18EED2_	Department Elective -II	4	0	0	4	50	50	100	3
18EED3_	Department Elective - III	4	0	0	4	50	50	100	3
18_ _I_ _	Institutional Elective-I	4	0	0	4	50	50	100	3
18ME002	Industrial Management and Entrepreneurship Development	4	0	0	4	50	50	100	3
18EE706	Constitution of India	3	0	0	3	50	50	100	0
18EEP01	Project Stage -I	0	0	6	6	50	50	100	2
18EEL72	Power Systems Lab	0	0	3	3	50	50	100	1
18EEL73	Electronics Design Lab	0	0	6	6	50	50	100	2
18EEL74	Internship					100		100	2
	TOTAL	**23**	**0**	**15**	**38**	**500**	**400**	**900**	**22**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

Department Elective - II

18EED21: Electrical Machine Design
18EED22: Control Systems Design
18EED23: Switched Mode Power Supply
18EED24: Digital Protection of Power System

Department Elective - III

18EED31: HVDC & FACTS
18EED32: Electrical and Hybrid Vehicles
18EED33: Line Commutated and Active Rectifiers
18EED34: Computer Aided Power System

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Electrical and Electronics Engineering
Effective from the Academic Year2018-2019 (R18 Regulations)
Fourth Year B.Tech (SEMESTER – VIII)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18EED4_	Department Elective -IV	4	0	0	4	50	50	100	3
18_ _I_ _	Institutional Elective -II	4	0	0	4	50	50	100	3
18EED5_	Department Elective -V	4	0	0	4	50	50	100	3
18EEP02	Project Stage -II	0	0	20	20	75	75	150	10
	TOTAL	**12**	**0**	**20**	**32**	**225**	**225**	**450**	**19**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

Department Elective -IV
18EED41: Power Quality
18EED42: Smart Grid Technology and Applications
18EED43: Machine Modeling and Analysis
18EED44: Advanced Electric Drives

Department Elective -V
18EED51: Energy Storage Systems
18EED52: Industrial Electrical Systems
18EED53: Digital Control Systems
18EED54: Wavelet Transforms

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Institutional Elective-I

18CEI01: Air Pollution & Control
18CEI02: Sustainable Water and Sanitation
18CSI01: Java Programming
18CSI02: Database Management Systems
18ECI01: Consumer Electronics
18ECI02: Embedded Systems
18EII01: Principles & Applications of MEMS
18EII02: Power System Instrumentation
18ITI01: Data Analytics
18ITI02: Cyber Security
18MEI01: Fluid Power and Control Systems
18MEI02: Project Management
18MAI01: Linear Algebra
18PHI01: Nano-Materials and Technology
18PHI02: Fiber Optic Communication
18HUI01: System Thinking
18ELI01: English for Competitive Examinations
18ELI02: Professional Communication

Institutional Elective-II

18CEI03: Disaster Management
18CEI04: Remote sensing & GIS
18CSI03: Python Programming
18CSI04: Computer Networks
18ECI03: Artificial Neural Network
18ECI04: Internet of Things (IoT)
18EII03: Robotics and Automation
18EII04: Advanced Computer Control Systems
18ITI03: Mobile Application Developments
18ITI04: Web Technology
18MEI03: Non-Conventional Energy Sources
18MEI04: Automobile Engineering
18MAI02: Graph Theory
18PHI03: Advanced Materials
18PHI04: Optical Electronics
18HUI02: Organizational Psychology
18HUI03: Telugu Modern Literature
18ELI03: English through Media

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LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

I B.Tech – I Semester (Code: 18EE101)

Lectures	3	Tutorial	1	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3hours)			50

Prerequisites: None

Course Objectives: To make the students

- Solve a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors.
- Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order and higher order ordinary differential equations.
- Create and analyze mathematical models using first and second order differential equations to solve application problems that arises in engineering.
- Create and analyze mathematical models using first and second order differential equations to solve application problems that arises in engineering.

Course Outcomes: At the end of this course, students will be able to

CO1: Find the eigen values and eigen vectors of a given matrix and its inverse.

CO2: Apply the appropriate analytical technique to find the solution of a first order ordinary differential equation.

CO3: Solve higher order linear differential equations with constant coefficients arise in engineering applications.

CO4: Apply Laplace transform to solve differential equations arising in engineering.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	2	-	-	-	-	-	-	2	3	-	-
CO2	3	3	3	-	2	-	-	-	-	-	-	2	3	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	2	3	-	-
CO4	3	3	3	-	1	-	-	-	-	-	-	2	3	-	-

UNIT – I

Linear Algebra: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse; Consistency of linear System of equations: Rouches theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values(without proofs); Cayley-Hamilton theorem (without proof).

[Sections: 2.7.1; 2.7.2; 2.7.6; 2.10.1; 2.10.2; 2.10.3; 2.12.1; 2.13.1; 2.14; 2.15.]

UNIT – II

Differential Equations of first order: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree: variables separable; Linear Equations; Bernoulli's equation; Exact Differential equations; Equations reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the equation M dx+ N dy = 0, is a function of x and is a function of y. Applications of a first order Differential equations: Newton's law of cooling; Rate of decay of Radio-active materials.
[Sections: 11.1; 11.3; 11.4; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2; 11.12.4; 12.6; 12.8]

UNIT – III

Linear Differential Equations: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working procedure to solve the equation; Method of Variation of Parameters; Applications of Linear Differential Equations: Oscillatory Electrical Circuits.
[Sections: 13.1; 13.2.1; 13.3; 13.4; 13.5; 13.6; 13.7;13.8.1;14.1;14.5].

UNIT – IV

Laplace Transforms: Definition; conditions for the existence; Transforms of elementary functions; properties of Laplace Transforms; Transforms of derivatives; Transforms of integrals; Multiplication by t^n; Division by t; Inverse transforms- Method of partial fractions; Other methods of finding inverse transforms; Convolution theorem(without proof); Application to differential equations: Solution of ODE with constant coefficients using Laplace Transforms.
[Sections:21.2.1; 21.2.2; 21.3; 21.4; 21.7; 21.8; 21.9; 21.10; 21.12; 21.13; 21.14; 21.15.1]

TEXT BOOKS:

1. B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.

REFERENCE BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons.K. J. Ayala, "8051 Microcontroller", Delmar Cengage Learning, 3rd Edition, 2007.
2. N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

WAVES AND MODERN PHYSICS

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(ENGINEERING PHYSICS-1)
I B.TECH – I SEMESTER (CODE-18PH001) (Common for ECE,EEE, EIE)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3hours)			50

Prerequisites: None

Course Objectives:

- To familiarize the students in getting knowledge about modern optics and their Engineering applications.
- To make aware of the students to obtain circuit knowledge regarding electrical, Electronics and Magnetism.
- To make the students to understand the quantum theory and solving the various Physical problems using quantum mechanics.
- To get the knowledge of various methods of analytical techniques for material testing.

Course Outcomes: At the end of this course, students will be able to

CO1: Learn about principle and working of different types of lasers and their applications.
CO2: Analyze the electromagnetic principles in electrical and electronic circuits and Maxwell's equations.
CO3: Study about quantum mechanics and its applications.
CO4: Read about properties and applications of ultrasonic in various fields.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	2	2	2	2	-	-	-	-	-	-	-	2	-
CO2	3	-	3	3	3	3	2	-	-	-	-	2	-	-	2
CO3	3	3	-	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	2	3	-	-	-	-	-	-	-	-	2	-

UNIT-I (ADVANCED OPTICS)

Lasers: Interaction of radiation with matter. Einstein co-efficient, Properties of laser, Population inversion, LASER principle, pumping schemes-Three level and four level laser, types of lasers: solid-state lasers (Ruby), gas lasers (He-Ne), Semiconductor lasers; applications of lasers in industry and medicine.

Fibre Optics: Importance of optical fibre, Structure and principle of optical fibre, acceptance angle and numerical aperture, Types of optical fibers based on modes and refractive index, V-number, losses associated with optical fibers, fiber optical communication, advantages of optical fiber.

UNIT-II (ELECTRO-MAGNETIC INDUCTION AND MAXWELL'S EQUATIONS)

Maxwell's equations in vacuum and conducting medium. Velocity of electromagnetic wave in vacuum. Electromagnetic oscillations in LC circuit, LCR series resonance in A.C circuit and resonant frequency, Quality factor. Concept of skin effect, Energy in an electromagnetic field; Flow of energy and Poynting vector. Principle of circulating charge and cyclotron, Hall Effect.

UNIT-III (MODERN PHYSICS)

Dual nature of light, Debroglie concept of matter waves, Davission- Germer experiment, Heisenberg uncertainty principle and applications (nonexistence of electron in nucleus and finite width of spectral lines), one dimensional time independent and dependent Schrodinger wave equation, physical significance of wave function, application of Schrödinger wave equation to particle in a one dimensional potential box, concept of quantum tunneling and construction and working of Scanning Tunneling Electron Microscope.

UNIT-IV (ANALYTICAL TECHNIQUES)

Ultrosonics: Properties of ultrasonic's, Production of ultrasonic waves by magneto striction andpiezo-electric method, Determination of velocity of ultrasonic wave in liquids by Ultrasonic interferometer. Medical applications, Ultrasonic Imaging technique (Doppler Ultrasound Imaging advantages and limitations), industrial applications, NDT : Pulse echo technique, Time of flight diffraction technique.

Nuclear Techniques: Radio isotopes and its applications (medical and Industrial), GM counter, Scintillation counter.

TEXT BOOK:

1. M.V.Avadhanulu, P.G.Kshirsagar, "Engineering physics", S.Chand & Company Pvt. Ltd.

2. PalaniSwamy, "Engineering physics", Scitech publication

REFERENCE BOOKS:

1. Dr.P.srinivasaRao, Dr.K.Muralidhar, "Basic engineering physics" Himalaya Publication

2. Dr.P.SrinivasaRao, Dr.K.Muralidhar, "Applied physics" Himalaya publication

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ENVIRONMENTAL STUDIES

I B.Tech – I Semester (Code: 18CE001)

Lectures	3	Tutorial	0	Practical	0	Credits	2
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Prerequisites: None

Course Objectives: To learn

- To develop an awareness, knowledge, and appreciation for the natural environment.
- To understand different types of ecosystems, exist in nature.
- To know our biodiversity.
- To understand different types of pollutants, present in Environment.
- To know the global environmental problems.

Course Outcomes: After completion of this course, Students will be able to

CO1: Develop an appreciation for the local and natural history of the area.

CO2: Hope for the better future of environment in India which is based on many positive factors like Biodiversity, successive use of renewable energy resources and other resources, increasing number of people's movements focusing on environment.

CO3: Know how to manage the harmful pollutants.

CO4: Gain the knowledge of Environment.

CO5: Create awareness among the youth on environmental concerns important in the long-term interest of the society

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	1	-	2	3	-	-	1	-	2	-	-	-
CO2	-	-	-	-	2	2	3	-	-	1	-	2	-	-	1
CO3	-	-	-	-	-	-	3	-	-	1	1	2	1	-	-
CO4	-	-	-	1	-	2	3	-	-	1	-	2	1	-	-
CO5	-	-	-	-	-	2	3	2	-	1	-	2	-	-	1

UNIT – I

Introduction: Definition, Scope and Importance, Need for public awareness. Ecosystems: Definition, Structure and Functions of Ecosystems, types - Forest, Grassland, Desert, Aquatic (Marine, pond and estuaries).

Biodiversity: Definition and levels of Biodiversity; Values of Biodiversity - Consumptive, Productive, Social, Aesthetic, Ethical and Optional; Threats and Conservation of Biodiversity; Hot Spots of Biodiversity, Bio-geographical Classification of India, India as a mega diversity nation. Chipko movement case study

UNIT – II

Natural resources: Land: Land as a resource, Causes and effects of land degradation - Soil erosion, Desertification. **Forest**: Use of forests, Causes and effects of deforestation, Afforestation, Mining - benefits and problems. **Water**: Uses, floods and drought, Dams - benefits and problems.

Energy: Importance of energy, Environmental Impacts of Renewable and Non-renewable energy resources. Silent Valley Project and Narmada Bachao Andolan case studies

Sustainability: Definition, Concept and Equitable use of resources for sustainable development; Rain water harvesting and Watershed management. Fieldwork on Rain water harvesting and Watershed management.

UNIT – III

Pollution: Definition; Causes, effects and control of air, water and nuclear pollution; Chernobyl Nuclear Disaster case study; Solid Waste: urban, Industrial and hazardous wastes; Integrated waste management - 3R approach, composting and vermin composting. **Environmental acts:** Water and air (Prevention and Control of pollution) acts, Environmental protection act, Forest Conservation act.

UNIT – IV

Environmental issues: Greenhouse effect & Global warming, Ozone layer depletion, Acid rains, Green Revolution, Population Growth and environmental quality, Environmental Impact Assessment. Environmental Standards (ISO 14000, etc.)

Case Studies: Bhopal Tragedy, Mathura Refinery and TajMahal, and Ralegan Siddhi (Anna Hazare).

Field work: Visit to a local area to document environmental assets – Pond/Forest/Grassland. Visit to a local polluted site- Urban and industry/ Rural and Agriculture.

TEXT BOOKS:

1. Benny Joseph, “Environmental Studies”, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. JP Sharma, “Comprehensive environmental studies”, Laxmi Publications.
3. ErachBharucha, “Text Book of environmental Studies”

REFERENCE BOOKS:

1. R.Rajagopalan, “Environmental studies”, Oxford University Press.
2. Anjaneyulu Y, “Introduction to Environmental Science”, B S Publications
3. Jr. G. Tyler Miller, “Environmental Science”, 11th Edition – Thomson Series.

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COMMUNICATIVE ENGLISH

I B.Tech – I Semester (Code: 18EL001)

Lectures	3	Tutorial	0	Practical	0	Credits	2
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Course Objectives: The course aims

- To enhance the vocabulary competency of the students
- To enable the students to demonstrate proficiency in the use of written English, including properspelling, grammar, and punctuation
- To enhance theoretical and conceptual understanding of the elements of grammar
- To understand and apply the conventions of academic writing in English
- To enhance the learners' ability of communicating accurately and fluently

Course Outcomes : After the completion of this course, students would be able to

CO1: Understand how to build academic vocabulary to enrich their writing skills

CO2: Produce accurate grammatical sentences

CO3: Study and interpret the texts given

CO4: Produce coherent pieces of writing with adequate support and detail

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	-	3	2	2	2	-	-	2
CO2	-	-	-	-	-	-	-	-	3	2	2	2	-	-	2
CO3	-	-	-	-	-	-	-	-	3	2	2	2	-	-	2
CO4	-	-	-	-	-	-	-	-	3	2	2	2	-	-	2

UNIT-I

1.1 **Vocabulary Development**: Word Formation-Formation of Nouns, Verbs & Adjectives from Root words-Suffixes and Prefixes
1.2 **Essential Grammar:** Prepositions, Conjunctions, Articles
1.3 **Basic Writing Skills**: Punctuation in writing
1.4 **Writing Practices**: Mind Mapping, Paragraph writing (structure-Descriptive, Narrative, Expository & Persuasive)

UNIT-II

2.1 **Vocabulary Development**: Synonyms and Antonyms
2.2 **Essential Grammar**: Concord, Modal Verbs, Common Errors
2.3 **Basic Writing Skills**: Using Phrases and clauses

2.4 **Writing Practices**: Hint Development

UNIT III

3.1 **Vocabulary Development**: One-word Substitutes
3.2 **Essential Grammar**: Tenses, Voices
3.3 **Basic Writing Skills**: Sentence structures (Simple, Complex, Compound)
3.4 **Writing Practices**: Note Making

UNIT IV

4.1 **Vocabulary Development**: Words often confused
4.2 **Essential Grammar**: Reported speech, Common Errors
4.3 **Basic Writing Skills**: Coherence in Writing: Jumbled Sentences
4.4 **Writing Practices**: Paraphrasing & Summarising

Reference Books

1. Communication Skills, Sanjay Kumar & Pushpa Latha. Oxford University Press: 2011.
2. Practical English Usage, Michael Swan. Oxford University Press: 1995.
3. Remedial English Grammar, F.T.Wood. Macmillan: 2007.
4. Study Writing, Liz Hamp lyons & Ben Heasley. Cambridge University Press:2006

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ENGINEERING GRAPHICS

I B.Tech – I Semester (Code: 18MEL01)

Lectures	1	Tutorial	0	Practical	4	Credits	3
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Prerequisites: None

Course Objectives: To learn

- clear picture about the importance of engineering graphics in the field of engineering
- the drawing skills and impart students to follow Bureau of Indian Standards
- To give an idea about Geometric constructions, Engineering curves, orthographic projections and pictorial projections
- imagination skills about orientation of points, lines, surfaces and solids
- basic drafting skills of AutoCAD

Course Outcomes: After completion of this course, Students will be able to

CO1: draw projections of points and projections of lines using Auto CAD
CO2: plot projections of surfaces like circle, square and rhombus
CO3: plot the Projections of solids like Prisms and pyramids
CO4: convert the of Orthographic views into isometric views of simple objects
CO5: generate the of pictorial views into orthographic views of simple castings

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-

UNIT – I

INTRODUCTION: Introduction to Drawing instruments and their uses, geometrical construction procedures

INTRODUCTION TO AUTOCAD:

Basics of sheet selection, draw tools, Modify tools, dimensioning

METHOD OF PROJECTIONS: Principles of projection - First angle and third angle projection of points. Projection of straight lines. Traces of lines.

UNIT II

PROJECTIONS OF PLANES: Projections of plane figures: circle, square, rhombus, rectangle, triangle, pentagon and hexagon.

UNIT – III

PROJECTIONS OF SOLIDS: Projections of Cubes, Prisms, Pyramids, Cylinders and Cones Inclined to one plane. .

UNIT –IV

ISOMETRIC PROJECTIONS: Isometric Projection and conversion of Orthographic views into isometric views. (Treatment is limited to simple objects only).

ORTHOGRAPHIC PROJECTIONS: Conversion of pictorial views into Orthographic views. (Treatment is limited to simple castings).

TEXT BOOK:

1. Dhananjay M. Kulkarni, "Engineering Drawing with AutoCAD" PHI publication
2. N.D. Bhatt & V.M. Panchal, "Engineering Drawing", Charotar Publishing House.

REFERENCE BOOKS:

1. Dhananjay AJolhe, "Engineering Drawing" Tata McGraw hill publishers
2. Prof.K.L.Narayana& Prof. R.K.Kannaiah, "Engineering Drawing"

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PHYSICS LABORATORY

I B.Tech– I Semester (Code: 18PHL01)

(COMMON TO ALL BRANCHES)

Lectures	**0**	Tutorial	0	Practical	**3**	Credits	**1**
Continuous Internal Assessment			**50**	Semester End Examination (3hours)			**50**

Course Objectives: To make the students

- Realize the importance of electrical and magnetic laws.
- Quantify the various physical parameters through optical principles.
- Estimate the material parameters through stress and strain experiments.
- Explore and operate the different optoelectronic devices.

Course Outcomes: After completion of this course, Students will be able to

CO1: Acknowledge the important aspects of earth magnetic field, realize the use of Maxwell's equations in various magnetic applications.

CO2: Applications of basic principles of optics to estimate physical parameters.

CO3: Realization of material properties and parameters.

CO4: Get hands on experience in various opto-electronic devices like Solar Cell, Photo Cell and their applications

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	3	-	1	-	-	-	-	-	-	-	-	-	-

LIST OF EXPERIMENTS

1. Determination of acceleration due to gravity at a place using compound pendulum.
2. Study the variation of intensity of magnetic field along the axis of a circular coil using Stewart-Gee's apparatus.
4. Determination of thickness of thin wire using air wedge interference bands.
5. Determination of radius of curvature of a Plano convex lens by using Newton's rings.
6. Determination of wavelengths of mercury spectrum using grating normal incidence method.
7. Determination of dispersive power of a given material of prism using prism minimum deviation method.
8. Draw the resonant characteristic curves of L.C.R. series circuit and calculate the resonant frequency.
9. Draw the characteristic curves of a photocell and calculate the maximum velocity of electron.
10. Verify the laws of transverse vibration of stretched string using sonometer.
11. Determine the rigidity modulus of the given material of the wire using Torsional Pendulum.
12. Draw the load characteristic curves of a solar cell.

13. Determination of Hall coefficient of a semiconductor.
14. Determination of voltage and frequency of an A.C. signal using C.R.O.
15. Determination of Forbidden energy gap of Si &Ge.
16. Determination of wavelength of laser source using Diode laser.

Any three experiments are virtual

TEXT BOOK:P.Srinivasarao & K.Muralidhar, "Engineering physics laboratory manual", Himalaya publications.

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ENGLISH COMMUNICATION SKILLS LABORATORY

I B.Tech – I Semester (Code:18ELL01)

Lectures	**0**	Tutorial	0	Practical	**3**	Credits	**1**
Continuous Internal Assessment			**50**	Semester End Examination (3hours)			**50**

English Communication Skills (ECS) Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning

Course Objectives:

The course aims

- To sensitize the students to the nuances of English speech sounds, word accent, intonation andrhythm
- To bring about a consistent accent and intelligibility in students' pronunciation of English byproviding an opportunity for practice in speaking
- To improve students' fluency in English and neutralize their mother tongue
- To make them use effective vocabulary both in formal and informal situations

Course Outcomes: After completion of this course, Students will be able to

CO1: Better understand the nuances of English language through audio- visual experience and groupactivities
CO2: Develop neutralization of accent for intelligibility
CO3: Build confidence to enhance their speaking skills
CO4: Use effective vocabulary both in formal and informal situations

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	-	3	2	2	2	-	-	2
CO2	-	-	-	-	-	-	-	-	3	2	2	2	-	-	2
CO3	-	-	-	-	-	-	-	-	3	2	2	2	-	-	2
CO4	-	-	-	-	-	-	-	-	3	2	2	2	-	-	2

UNIT-I

1.1 Listening Skills; Importance – Purpose- Process- Types
1.2 Barriers to Listening
1.3 Strategies for Effective Listening

UNIT-II

2.1 Phonetics; Introduction to Consonant, Vowel and Diphthong sounds
2.2 Stress
2.3 Rhythm
2.4 Intonation

UNIT-III

3.1 Formal and Informal Situations
3.2 Expressions used in different situations
3.3 Introducing Yourself & Others-Greeting & Parting-Congratulating-Giving Suggestions& Advices-Expressing Opinions-Inviting People-Requesting-Seeking Permission-GivingInformation- Giving Directions- Sympathizing-Convincing People- Complaining & Apologizing-Thanking Others- Shopping-Travelling- Conversational Gambits

UNIT-IV

4.1 JAM Session
4.2 Debates
4.3 Extempore

Reference Books:

1. Communication Skills, Sanjay Kumar and Pushpa Lata. Oxford University Press. 2011
2. Better English Pronunciation, J.D. O' Connor. Cambridge University Press:1984
3. New Interchange (4rth Edition), Jack C Richards. Cambridge University Press:2015
4. English Conversation Practice, Grant Taylor. Mc Graw Hill:2001

Software:

1. Buzzers for conversations, New Interchange series
2. English in Mind series, Telephoning in English
3. Speech Solutions, A Course in Listening and Speaking

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WORKSHOP PRACTICE LAB

B.Tech – I Semester (Code: 18MEL02)

Lectures	**0**	Tutorial	0	Practical	**3**	Credits	**1**
Continuous Internal Assessment			**50**	Semester End Examination (3hours)			**50**

Prerequisites: None

Course Objectives:

- To impart student knowledge on various hand tools for usage in engineering applications.
- Be able to use analytical skills for the production of components.
- Design and model different prototypes using carpentry, sheet metal and welding.
- Make electrical connections for daily applications.
- To make student aware of safety rules in working environments.

Course Outcomes: After completion of this course student should be able to:

CO1: Make half lap joint, Dovetail joint and Mortise &Tenon joint

CO2: Produce Lap joint, Tee joint and Butt joint using Gas welding

CO3: Prepare trapezoidal tray, Funnel and T-joint using sheet metal tools

CO4: Make connections for controlling one lamp by a single switch, controlling two lamps by a single switch and stair case wiring.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	2	-	2	-	2	-	-	1	-	2	1	2	3
CO2	2	3	2	-	2	-	2	-	-	1	-	2	1	2	3
CO3	2	3	2	-	2	-	2	-	-	1	-	1	1	2	3
CO4	-	-	2	-	2	-	2	-	-	1	-	1	-	-	2

Syllabus:

1. Carpentry
   a. Half Lap joint
   b. Dovetail joint
   c. Mortise &Tenon joint
2. Welding using electric arc welding process/gas welding
   a. Lap joint
   b. Tee joint
   c. Butt joint
3. Sheet metal operations with hand tools
   a. Trapezoidal tray
   b. Funnel
   c. T-joint
4. House wiring
   a. To control one lamp by a single switch
   b. To control two lamps by a single switch
   c. Stair-case wiring

TEXT BOOKS:

1. P.Kannaiah and K.L.Narayana, "Workshop Manual", SciTech Publishers, 2009.
2. K. Venkata Reddy, "Workshop Practice Manual", BS Publications, 2008.

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NUMERICAL METHODS AND ADVANCED CALCULUS

I B.Tech – II Semester (Code: 18EE201)

Lectures	3	Tutorial	1	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3hours)			50

Prerequisites: None

Course Objectives: To make the students

- Solve algebraic, transcendental and system of linear equations with the help of numerical methods.
- Apply the techniques of numerical integration whenever and wherever routine methods are not applicable and solve the first order ordinary differential equations numerically with the given initial condition using different methods.
- Evaluate double and triple integrals and apply them to find areas and volumes.
- Evaluate the line, surface and volume integrals and learn their inter-relations and applications.

Course Outcomes: At the end of this course, students will be able to

CO1: Solve non-linear equations and system of linear equations with the help of Numerical techniques.
CO2: Solve the first order ordinary differential equations numerically with the given initial condition.
CO3: Find the area and volume of plane and three-dimensional figures using multiple integrals.
CO4: Apply vector integral theorems to obtain the solutions of engineering problems involving circulation, flux, and divergence in vector fields.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	2	-	-	-	-	-	-	-	1	3	-	-
CO2	3	3	1	2	-	-	-	-	-	-	-	2	2	-	-
CO3	3	3	1	2	2	-	-	-	-	-	-	2	2	-	-
CO4	3	3	3	2	2	-	-	-	-	-	-	2	2	-	-

UNIT – I

Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi's iterative method, Gauss-Seidel iterative method

[Sections:28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2].

UNIT – II

Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton's interpolation formulae: Newton's forward interpolation formula, Newton's backward interpolation formula; Interpolation with unequal intervals; Lagrange's interpolation formula; Divided differences; Newton's divided difference formula; Numerical integration; Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Numerical solution of ODE's: Introduction; Picard's method; Euler's method; Runge-Kutta method.

[Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.2; 32.4; 32.7].

UNIT – III

Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integral, Change of variables.

[Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2].

UNIT – IV

Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green's theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem(without proof).

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[Sections: 8.4; 8.5; 8.5.1; 8.5.3; 8.6; 8.11.1; 8.12.2; 8.12.3; 8.13; 8.14; 8.16]

TEXT BOOKS:

1. B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.

REFERENCE BOOKS:

1.Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons.K. J. Ayala, "8051 Microcontroller", Delmar Cengage Learning, 3rd Edition, 2007.
2.N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

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CHEMISTRY

(Common to all branches)

I B.Tech – II Semester (Code: 18CY001)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

PREREQUISITES: None

Course Objectives: The student should be conversant

- With the principles of water characterization and treatment of water for industrial purposes and methods of producing water for potable purposes.
- To understand the thermodynamic concepts, energy changes, concept of corrosion & its control.
- With the conventional energy sources, solid, liquid and gaseous Fuels & knowledge of knocking and anti-knocking characteristics.
- With aim to gain good knowledge of organic reactions, plastics, conducting polymers & biodegradable polymers.

Course Outcome: After studying this course, students will be able to

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

CO2: Apply their knowledge in converting various energies of different systems and protection of different metals from corrosion.

CO3: Have the capacity of applying energy sources efficiently and economically for various needs.

CO4: Design economically and new methods of organic synthesis and substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	2	3	-	2	3	-	-	-	-	3	2	2	-
CO2	2	3	2	3	-	2	3	-	-	-	-	3	2	2	-
CO3	2	3	2	3	-	2	3	-	-	-	-	3	2	2	-
CO4	2	3	3	3	-	2	3	-	-	-	-	3	2	2	-

UNIT -I

Characteristics: Alkalinity, Hardness **-** Estimation & simple numerical problems,

Boiler Troubles - Sludges, Scales, Caustic embrittlement, boiler corrosion, Priming and foaming;

Internal conditioning- phosphate, calgon and carbonate methods.

External conditioning - Ion exchange process & Zeolite proess WHO Guidelines, Potable water, Sedimentation, Coagulation, Filtration. Disinfection methods: Chlorination, ozonization and UV treatment. Salinity – Treatment of Brackish water by Reverse Osmosis

and Electrodialysis.

UNIT- II

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.

Corrosion: Types of corrosion - Chemical or dry corrosion, Electrochemical or wet corrosion; Galvanic, stress, pitting and differential aeration corrosion; Factors effecting corrosion.

Corrosion control – Cathodic protection, and electro plating (Au)& electroless Ni plating.

UNIT- III

Fuels: Classification of fuels; Calorific value of fuels (lower, higher)

Solid fuels: Determination of calorific value (Bomb Calorimeter) & related problems, Coal ranking,

Liquid Fuels: Petroleum refining and fractions, composition and uses. Knocking and anti-knocking Agents, Octane number and Cetane number; Bio fuels- Biodiesel, general methods of preparation and advantages

Gaseous fuels: CNG and LPG, Flue gas analysis – Orsat apparatus.

UNIT- IV

Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution (SN^1, SN^2), addition (Markownikoff's and anti-Markwnikoff's rules), elimination (E_1& E_2), Synthesis of a commonly used drug molecule. (Aspirin and Paracetamol)

Polymers: Conducting polymers: Classification, Intrinsic and Extrinsic conducting polymers and their applications**.** Plastics: Thermo plasts and thermosetting plastics, Bskelite and PVC. Bio degradable polymers: types, examples-Polyhydroxybuterate (PHB), Polyhydroxybuterate-co-β-hydroxyvalerate (PHBV), applications.

TEXT BOOKS:

1. P.C. Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi 17th edition (2017).
2. SeshiChawla, "Engineering Chemistry"DhanpatRai Pub, Co LTD, New Delhi 13 th edition, 2013.

REFERENCES:

1 Essential Of Physical Chemistry by ArunBahl, B.S. Bahl, G.D.Tuli, by ArunBahl, B.S. Bahl, G.D.Tuli, Published by S Chand Publishers, 12th Edition, 2012.

2 Text Book of Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).

3 Engineering Chemistry by K. Maheswaramma, Pearson publishers 2015.

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SEMICONDUCTOR PHYSICS AND NANO MATERIALS

I B.Tech II-semester(CODE: 18PH003)

(Common for CSE, IT,EEE,&EIE)

Lectures	4	Tutorials	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination			50

Course Objectives:

- This unit aim to build the foundation and inspires interest of freshmen into electrical and electronics and to focus on fundamental concepts and basic principles regarding electrical conduction.
- This unit provides various properties of semiconductor materials and their importance in various device fabrications.
- This unit aim to educate the student on various opto-electronic devices and their applications.
- This unit provide information about the principles of processing, manufacturing and characterization of nano materials, nanostructures and their applications.

Course Outcomes: After the completion of this course , students will be able to

CO1: Understand concepts of band structure of solids, concept of hole and effective mass of electron in semiconductors.

CO2: Understand the concept of Fermi level and various semiconductor junctions.

CO3: Familiar with working principles of various opto-electronic devices and their applications.

CO4: Understand importance of nano-materials and their characteristic properties.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	2	-	-	-	-	-	-	-	3	-	2	-
CO2	3	3	-	2	-	-	-	-	-	-	-	3	-	-	1
CO3	3	-	3	3	2	2	3	-	-	-	-	3	-	-	-
CO4	3	3	2	2	2	-	-	-	-	-	-	3	-	2	-

UNIT –I

ELECTRONIC MATERILAS: Somerfield free electron theory, Fermi level and energy, density of states, Failure of free electron theory (Qualitative), Energy bands in solids, E-K diagrams, Direct and Indirect band gaps. Types of Electronic materials: Metals, Semi-conductors and Insulators, Occupation Probability, effective mass, Concept of hole.

UNIT – II

SEMICONDUCTORS: Introduction to semiconductors, intrinsic and extrinsic semiconductors, carrier concentrations, Fermi level and temperature dependence, Continuity

equation, Diffusion and drift, P-N junction (V-I characteristics), Metal – Semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for opto- electronic devices.

UNIT-III

OPTO-ELECTRONIC DEVICES AND DISPLAY DEVICES: Photo voltaic effect, principle and working of LED, Applications of Photo diode, Solar cell, PIN & APD Diode, Liquid crystal display, Opto electric effect: Faraday Effect and Kerr effect.

UNIT-IV

NANO-MATERIALS: Introduction to nano technology, quantum confinement, surface to volume ratio, properties of nano materials, synthesis of nano-materials: CVD, sol-gel methods, laser ablation. Carbon nano tubes: types, properties, applications. Characterization of nano materials: XRD, SEM, applications of nano materials.

TEXT BOOKS:

1. A text book of engineering physics by Avadhanulu and Kshirsagar S.Chand& Co. (2013)
2. Applied physics by Dr.*P.Srinivasa Rao*. Dr.K.*Muralidhar*
3. Introduction to solid state state physics, Charles Kittel, 8th edition
4. Solid state physics, S.O. Pillai

REFERENCE BOOKS:

1. Text book on Nanoscience and Nanotechnology (2013): B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath and J. Murday, Springer Science & Business Media.
2. Basic Engineering Physics, Dr.*P.SrinivasaRao*. Dr.K.*Muralidhar*. Himalaya Publications,2016

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CIRCUIT THEORY

I B.Tech – II Semester (Code: 18EE204)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Mathematics, Basic Physics

Course Objectives: To make the students

- Discuss about basic Laws in circuits, circuit elements and sources and their characteristics.
- Describe fundamental concepts of alternating current and voltages, power triangle and power factor.
- Analyze circuits with network topology.
- Illustrate circuits with different DC and AC sources.
- Explain statement and application of various theorems.
- Realize concept of resonance in series and parallel circuits.

Course Outcomes: After the completion of the course, students will be able to

CO1: Explain the basic Laws, circuit elements and sources with their characteristics.

CO2: Demonstrate phasor diagrams, phase relations in elements and power triangle

CO3: Analyze circuits with network topology.

CO4: Solve problems involving with different AC and DC sources in electrical circuits.

CO5: Apply and analyze the circuits with various theorems.

CO6: Illustrate and analyze the series and parallel resonance circuits.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO6	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-

UNIT – I

CIRCUIT ELEMENTS AND SOURCES: Basic definition of the unit of Charge, Voltage, Current, Power and Energy, Circuit concept, various circuit elements, Ideal, Practical and

dependent sources and their V-I characteristics, Source transformation, Voltage and Current division, series / parallel combination of elements, Star-Delta transformation, Energy stored in Inductors and Capacitors, Kirchhoff's laws, Instantaneous, Peak, Average and RMS values of various waveforms, Crest factor, Form factor; Concept of phase and phase difference in sinusoidal waveforms, Phase relation in pure resistor, Inductor and capacitor, Impedance diagram, phasor diagram, series and parallel circuits, compound Circuits, Computation of active, reactive and complex powers, power triangle, power factor.

UNIT – II

NETWORK TOPOLOGY: Concepts of a Network Graph, Terminology used in Network Graph, Relation between Twigs and Links, Formation of incidence matrix, tie-set matrix, fundamental tie-set matrix, cut-set matrix, fundamental cut-set matrix and Relation between matrices, Kirchhoff's voltage law in Topological form, Kirchhoff's current law in Topological form, Relation between branch voltage, Twig voltage matrix and node voltage matrix, Relation between branch voltage matrix and loop current matrix, Network equilibrium equations, principle of duality and construction of a dual network.

UNIT – III

CIRCUIT ANALYSIS AND NETWORK THEOREMS: Mesh, Super mesh, Node and Super node Analysis, Analysis with dependent current and voltage sources, Superposition theorem, Thevenin's and Norton's theorems, Reciprocity, Compensation, Maximum power transfer theorems, Tellegen's and Millman's theorems to both independent and dependent current and voltage sources.

UNIT – IV

RESONANCE: Series resonance, Impedance and phase angle, voltages and currents, bandwidth and Q factor and its effect on bandwidth, magnification, parallel resonance, resonant frequency, variation of impedance with frequency , Q factor, magnification, reactance curves in parallel resonance, Locus diagrams for series and parallel circuits.

TEXT BOOKS:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, Engineering Circuit Analysis, 8th Edition,TMH, 2012.
2. M E Vanvalkenburg, Network Analysis, 3rd Edition, PHI, 2006.
3. C L Wadhwa, Network analysis and synthesis, New Age International, 2nd Edition, 2006.

REFERENCE BOOKS:

1. C K Alexander and M. N. O. Sadiku, Electric Circuits, McGraw Hill Education, 5th Edition, 2016.
2. Abhijit chakrabarti, Circuit theory analysis and synthesis Dhanapatrai &co (p) Ltd, 2018.
3. A Sudhakar and Shyam Mohan SP, Circuits and Networks: Analysis and Synthesis, 4th Edition, TMH, 2010.
4. J A Edminister, Electric circuits, Schaum outline series.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Network Analysis, https://nptel.ac.in/courses/108/105/108105159
2. NPTEL :: Electrical Engineering - NOC:Basic Electric Circuits, https://nptel.ac.in/courses/108/104/108104139/
3. NPTEL :: Electrical Engineering - NOC:Basic Electrical Circuits, https://nptel.ac.in/courses/108/106/108106172/

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PROBLEM SOLVING USING PROGRAMMING

(Common for all branches except Civil Engineering)

I B.Tech – II Semester (Code: 18CS001)

Lectures	3	Tutorial	0	Practical	0	Credits	2
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: BASIC MATHEMATICS

Course Objectives: Students will be able to

- Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, and Arithmetic rules.
- Develop problem-solving skills to translate 'English' described problems into programs written using C language.
- Use Conditional Branching, Looping, and Functions.
- Apply pointers for parameter passing, referencing and differencing and linking data structures.
- Manipulate variables and types to change the problem state, including numeric, character, array and pointer types, as well as the use of structures and unions, File.

Course Outcomes: After the completion of the course, students will be able to

CO1: Choose the right data representation formats based on the requirements of the problem.

CO2: Verify a given problem and develop an algorithm to solve the problem.

CO3: Use the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.

CO4: Write the program on a computer, edit, compile, debug, correct, recompile and run it.

CO5: Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	3	-	-	-	-	-	-	-	-	3	2	3
CO2	2	3	2	2	-	-	-	-	-	-	-	-	2	1	2
CO3	2	2	1	2	-	-	-	-	-	-	-	-	2	2	2
CO4	2	1	2	2	-	-	-	-	-	-	-	-	2	1	2
CO5	3	2	2	3	-	-	-	-	-	-	-	-	3	2	3

UNIT-I

Overview of C, Constants, Variables and Data Types, Operators and Expressions, Managing I/O Operations. Decision Making and Branching.

Programming Exercises for Unit I:C-expressions for algebraic expressions, evaluation of

arithmetic and Boolean expressions. Syntactic and logical errors in a given program, output of a given program, values of variables at the end of execution of a program fragment, Programs using Scientific and Engineering formulae. Finding the largest of the three given numbers. Computation of discount amount on different types of products with different discount percentages. Finding the class of an input character, finding the type of triangle formed with the given sides, computation of income-tax, finding given year is leap year or not, and conversion of lower case character to its upper case.

UNIT -II

Decision Making and Looping, Arrays, Character Arrays and Strings.

Programming Exercises for Unit II: To print the sum of the digits of a given number and to display the image of a given number. To find whether a given number is prime, printing Fibonacci sequence and to find prime factors of a given number. To print graphic patterns of symbols and numbers. To find the length of a string, compare strings, reverse a string, copy a string and to find whether the given string is palindrome or not with and without using String Handling Functions. Transpose of a matrix and sorting of names using arrays.

UNIT- III

User-defined Functions, Structures and Unions, Pointers

Programming Exercises for Unit - III: Functions - Recursive functions to find factorial & GCD (Greatest Common Divisor), string operations using pointers and pointer arithmetic. Swapping two variable values. Sorting a list of student records on register number using array of pointers

UNIT -IV

File Management in C, Dynamic Memory Allocation, Preprocessor

Programming Exercises for Unit - IV: Operations on complex numbers, and to read an input file of marks and generate a result file, sorting a list of names using command line arguments. Copy the contents of one file to another file. Allocating memory to variables dynamically.

TEXT BOOK:

1. E.Balaguruswamy, “Programming in ANSI C, Fifth Edition,.

REFERENCE BOOKS:

1. Kernighan BW and Dennis Ritchie M, “C programming language”, 2nded, Prentice Hall, .
2. Yashavant P. Kanetkar, “Let us C”, BPB Publications, .
3. Herbert Schildt, “C: The Complete Reference”, 4th edition, Tata Mcgraw-Hill, .
4. Ashok N.Kamthane, “Programming in C”, PEARSON 2nd Edition, .

NPTEL COURSE LINKS:

1. NPTEL :: Computer Science and Engineering - NOC:Problem Solving through Programming in C
2. NPTEL :: Computer Science and Engineering - NOC:Introduction to programming in C

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CHEMISTRY LABORATORY

(Common to all branches)

I B.Tech – II Semester (Code: 18CYL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Nil

Course Objectives: Students will be able

- The basics of chemistry lab to carry out the qualitative and quantitative analysis of any given sample.
- To determine the percentage purity of washing soda bleaching powder and given salt.
- The measurement of quality parameters of water to check its suitability for domestic and industrial purpose
- To estimate the characteristic properties of oil for its use at various level.
- To synthesize the Soap, Resin and Aromatic Ester followed by their applications.
- The use and utility of some instruments like P^H meter, Conductometer and Potentiometer for various applications.

Course Outcomes: After the completion of the course, students will be able to

CO1: Familiar with fundamental basics of Chemistry lab.

CO2: Estimate purity of washing soda, bleaching powder and quantity of Iron and other salts.

CO3: Gain the knowledge regarding the quality parameters of water like salinity, hardness, alkalinity etc.

CO4: Analyze the given oil for saponification and iodine value.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	-	-	-	-	-	-	-	3	2	-	1	2	-	-
CO2	2	2	2	2	-	2	-	-	3	2	-	1	1	-	-
CO3	2	2	2	2	-	2	-	-	3	2	-	1	-	1	-
CO4	2	2	2	2	-	-	-	-	3	2	-	1	2	1	-

LIST OF EXPERIMENTS

1. **Introduction to Chemistry Lab** (the teachers are expected to teach fundamentals like Calibration of Volumetric Apparatus, Primary, Secondary Solutions, Normality, Molarity, Molality etc. and error, accuracy, precision, theory of indicators, use of volumetric titrations).

2. **Volumetric Analysis:**
   a. Estimation of Washing Soda.
   b. Estimation of Active Chlorine Content in Bleaching Powder
   c. Estimation of Mohr's salt by permanganometry.
   d. Estimation of given salt by using Ion-exchange resin using Dowex-50.

3. **Analysis of Water:**
    a. Determination of Alkalinity of Tap water.
    b. Determination of Total Hardness of ground water sample by EDTA method
    c. Determination of Salinity of water sample
4. **Estimation of properties of oil**:
    a. Estimation of Acid Value
    b. Estimation of Saponification value
5. **Preparations:**
    a. Preparation of Soap
    b. Preparation of Urea-formaldehyde resin
    c. Preparation of Phenyl benzoate
6. **Demonstration Experiments (Any two of the following):**
    a. Determination of p^H of given sample.
    b. Determination of conductivity of given sample by conduct meter.
    c. Potentiometric Determination of Iron.

TEXT BOOKS (for Chemistry 1 and 2):

1. Practical Engineering Chemistry by K.Mukkanti, Etal, B.S. Publications, Hyderabad, 2009.
2. Inorganic quantitative analysis, Vogel, 5^{th} edition, Longman group Ltd. London, 1979.

REFERENCE BOOKS:

1. Text Book of engineering chemistry by R.n. Goyal and Harmendra Goel.
2. A text book on experiments and calculations- Engineering Chemistry. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

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CIRCUIT THEORY LAB

I B.Tech – II Semester (Code: 18EEL22)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Pre-requisites: Circuit theory, Mathematics

Course Objectives: To make the students

- Understand and verify basic Kirchhoff's laws in circuits.
- Understand and verify fundamental theorems of circuit theory.
- Able to determine the parameters of a given choke coil.
- Understand the locus diagrams of series RL, RC circuits.
- Understand and verify fundamental theorems of circuit theory using software.

Course Outcomes: After the completion of the course, students will be able to

CO1: Verify the basic Kirchhoff's laws in circuits.

CO2: Prove fundamental theorems of circuit theory.

CO3: Evaluate the parameters of a given choke coil.

CO4: Draw the locus diagrams of series RL, RC circuits.

CO5: Verify fundamental theorems of circuit theory using software.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	-	-	-	-	3	2	-	2	3	-	-
CO2	3	3	2	3	-	-	-	-	3	2	-	2	3	2	-
CO3	3	2	-	2	-	-	-	-	3	2	-	2	2	3	-
CO4	3	3	2	3	-	-	-	-	3	2	-	2	2	2	-
CO5	3	3	3	3	3	-	-	-	3	2	-	2	3	1	-

LIST OF EXPERIMENTS

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Verification of Thevenin's theorem
4. Verification of Norton's theorem
5. Verification of Reciprocity theorem
6. Verification of Maximum Power Transfer theorem
7. Parameters of Choke coil
8. Measurement of low and medium resistance using volt ampere method
9. Locus diagram of RL series circuit
10. Locus diagram of RC series circuit
11. Steady state analysis of RL, RC and RLC series circuits using software

12. Verification of Superposition theorem using software
13. Verification of Thevenin's and Norton's theorem using software
14. Verification of Maximum Power Transfer theorem DC and AC circuits using software
15. Locus diagram of RL and RC series circuit using software

Note: Minimum 10 experiments should be carried out.

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PROBLEM SOLVING USING PROGRAMMING LAB

I B.Tech – II Semester (Code: 18CSL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Mathematics

Course Objectives: To make the students

- Explain basic concepts of C Programming such as: C-tokens, Operators, Input/output, and Arithmetic rules.
- Develop problem-solving skills to translate "English" described problems into programs written using C language.
- Use Conditional Branching, Looping, and Functions.
- Apply pointers for parameter passing, referencing and differencing and linking data structures.
- Manipulate variables and types to change the problem state, including numeric, character, array and pointer types, as well as the use of structures and unions, File.

Course Outcomes: After the completion of the course, students will be able to

CO1: Identify the right data representation formats for the given problem.

CO2: Use appropriate conditional/iterative statements to solve the problems.

CO3: Apply the concepts of user defined functions and recursion to support reusability

CO4: Design an application using the concepts of array, pointer, structure, and file management to solve real world problem.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	2	-	-	-	-	-	-	-	2	-	-
CO2	3	3	3	-	2	-	-	-	-	-	-	-	2	-	-
CO3	3	3	3	-	2	-	-	-	-	-	-	-	2	-	-
CO4	3	3	3	-	2	-	-	-	-	-	-	-	2	-	-

1.A program for electricity bill taking different categories of users, different slabs in each category. (Using nested if-else statement).

Domestic Customer:		
Consumption Units	**Rate of Charges (Rs.)**	
0 – 200	0.50 per unit	
201 – 400	100 plus	0.65 per unit
401 – 600	230 plus	0.80 per unit
601 and above	390 plus	1.00 per unit
Commercial Customer:		
Consumption Units	**Rate of Charges (Rs.)**	
0 – 100	0.50 per unit	

101 – 200	50 plus	0.6 per unit
201 – 300	100 plus	0.70 per unit
301 and above	200 plus	1.00 per unit

2. Write a C program to evaluate the following (using loops):
   a) $1 + x^2/2! + x^4/4!+ \ldots$up to ten terms
   b) $x + x^3/3! + x^5/5!+ \ldots$ up to ten terms
3. Write a C program to check whether the given numberis
   a) Prime ornot.
   b) Perfect or Abundant or Deficient.
4. Write a C program to display statistical parameters (using one – dimensional array).
   a) Mean
   b) Mode
   c) Median
   d) Variance.
5. WriteaCprogramtoreadalistofnumbersandperformthefollowingoperations
   a) Print the list.
   b) Delete duplicates from the list.
   c) Reverse the list.
6. Write a C program to read a list of numbers and search for a given number using Binary search algorithm and if found display its index otherwise display the message "Element not found in the List".

7. Write a C program to read two matrices and compute their sum and product.
8. Write a C program to read list of student names and perform the following operations
   a) To print the list of names.
   b) To sort them in ascending order.
   c) To print the list after sorting.
9. Write a C program that consists of recursive functions to

   a) Find factorial of a given number

   b) Solve towers of Hanoi with three towers (A, B & C) and three disks initially on tower A.

10. A Bookshop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book the sales person inputs the title and the author, and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed, if it is, then the system displays the book details and request for the number of copies required ,if the requested copies are available the total cost of the requested copies is displayed otherwise the message "required copies not in stock" is displayed. Write a program for the above in structures with suitable functions.

11. Write a C program to read a data file of students' records with fields(Regno, Name, M1,M2,M3,M4,M5) and write the successful students data (percentage > 40%) to a data file.

12. Write a C program to read a file as command line argument and count the given word frequency in a file

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PROBABILITY AND STATISTICS

II B.Tech – III Semester (Code: 18EE301)

Lectures	3	Tutorial	1	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: To make the students

- Apply the continuous probability densities to various problems in science and engineering.
- Estimate the point and interval estimators of the mean, variance and proportion for the given Sample data and apply Z-test, t-test to various real-life problems
- Apply various sample tests like F-test and $\chi 2$ -test for decision making regarding the
- Compute the level of correlation, the best fit curve to the given data by the method of least squares and also perform ANOVA arising in the field of engineering.

Course Outcomes: After the completion of the course, students will be able to

CO1: Apply discrete and continuous probability distributions to various problems arising in Engineering applications.

CO2: Perform Test of Hypothesis for a population parameter for single sample.

CO3: Perform Test of Hypothesis for population parameters for multiple samples.

CO4: Interpret the results of correlation, regression and one way ANOVA for the given data.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	-	-	-	-	-	-	-	-	2	3	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-

UNIT – I

Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Gamma Distribution and its applications, Beta Distribution and its applications, Weibull distribution, Joint Distributions (Discrete), Joint Distributions (Continuous).

[Sections 5.1, 5.2, 5.3, 5.5,5.7, 5.8, 5.9, 5.10]

UNIT – II

Populations and Samples, The sampling distribution of the mean (σ known), The sampling distribution of the mean (σ unknown), The sampling distribution of the variance, Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of hypotheses, Hypothesis concerning one mean.

[Sections 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.4, 7.5, 7.6]

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UNIT – III

Comparisons-Two independent Large samples, Comparisons-Two independent small samples, matched pairs comparisons, The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances.

[Sections 8.2, 8.3, 8.4, 9.1, 9.2, 9.3]

UNIT – IV

Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions. The method of least squares, curvilinear regression, multiple regression, correlation, Completely Randomized Designs**.**

[Sections 10.1, 10.2, 10.3, 11.1, 11.3, 11.4, 11.6, 12.1, 12.2]

TEXT BOOKS:

1. Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson, 8th Edition, PHI. .

REFERENCE BOOKS:

1. R.E Walpole, R.H. Myers & S.L. Myers 'Probability & Statistics for Engineers and Scientists', 6th Edition, PHI.

2. Murray R Spiegel, John J.Schiller, R. AluSrinivasa, 'Probability &Satistics', Schaum's outline series.

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NETWORK ANALYSIS

II B. Tech – III Semester (Code: 18EE302)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Mathematics

Course Objectives: To make the students.

- Infer and evaluate transient response, Steady state response for single phase systems.
- Interpret the circuits using Laplace Transforms.
- Understand the concepts of three-phase systems and its analysis.
- Evaluate two-port network parameters and network functions.
- Formulate the equations of coupled circuits and their behavior.
- Construct passive filters using constant K and M derived methods.

Course Outcomes: After the completion of the course, students will be able to

CO1: Solve transient response, steady state response for DC and AC excited systems.

CO2: Apply Laplace Transforms to electrical circuit and its analysis.

CO3: Determine the voltages, currents and powers in three-phase circuits with balanced and unbalanced loads.

CO4: Evaluate two-port network parameters, network functions.

CO5: Demonstrate the coupled circuits and its behavior.

CO6: Illustrate passive filters using constant K and M derived methods.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO6	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-

UNIT – I

Solution of First and Second order networks: Solution of first and second order differential equations for Series and parallel R-L, R-C, RLC circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response for DC and AC excitations.

Electrical Circuit Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, Frequency response (magnitude and phase plots).

UNIT – II

Poly Phase Systems: Advantages of 3-phase systems, generation of 3-phase voltages, phase sequence, star & delta connections, interconnection of 3-phase sources and loads, voltage, current & power in star & delta connected systems, analysis of 3-phase balanced circuit,

measurement of 3-phase power, 2 wattmeter method. Analysis of 3-phase unbalanced systems, star / delta transformation method, application of KVL and Mill man's method.

UNIT-III

Two Port Network and Network Functions: Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interrelation of two port network, interconnections of two port networks, image parameters, Two-Port bridged – T, Ladder and Lattice networks. transformed network with initial conditions. Transfer function representation. Poles and Zeros - Network functions for the one port and two port - Poles and Zeros of network functions - Restrictions on pole and zero locations for driving point functions and transfer functions - Time domain behavior from the pole zero plot..

UNIT-IV

Coupled Circuits: Defining self and mutual inductance, coefficient of coupling, dot convention, Development of circuit equations in time domain and frequency domain, solutionof coupled circuits, series and parallel connections of two coupled coils, tuned circuit analysis(single and double tuned)

Filters: Low pass, high pass, band pass & band reject filters - frequency response, constant K– and M derived – filters.

TEXT BOOKS:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineering CircuitAnalysis", 8th Edition,TMH, 2013.
2. A Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", 5th Edition, TMH, 2017.

REFERENCE BOOKS:

1. M.E.Vanvalkenburg, "Network Analysis", 3rd Edition, PHI, 2006.
2. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education,5th Edition, 2016.
3. Abhijit Chakrabarti, "Circuit theory analysis and synthesis" Dhanapatrai & co(p) Ltd,2018.
4. C. L Wadhwa, "Network analysis and synthesis", New Age International, 2nd Edition,2006.
5. J.A.Edminister,"Electric circuits", Schaum outline series,.

NPTEL COURSE LINKS:

1. **NPTEL :: Electrical Engineering - NOC:Network Analysis**
2. **NPTEL :: Electrical Engineering - NOC:Basic Electrical Circuits**
3. **NPTEL :: Electrical Engineering - NOC:Basic Electric Circuits**
4. **https://onlinecourses.nptel.ac.in/noc22_ee07/preview**
5. **https://archive.nptel.ac.in/courses/108/105/108105159/**

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ANALOG ELECTRONICS

II B.Tech – III Semester (Code: 18EE303)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics

Course Objectives: To make the students

- Understand formation of PN junction Diode and applications of diode like Rectifiers, clippers and clampers.
- To empower understand the design and working of BJT / FET amplifiers.
- Analyze different feedback and oscillating circuits.
- To give the idea about basics of Differential, Multi-stage and operational amplifiers**.**
- Gain knowledge about Linear and Nonlinear applications of Op-amp.

Course Outcomes: After completion of this course, **s**tudents will be able to

CO1: Demonstrate the fabrication of PN junction diode while delving into its diverse applications including rectification, clipping and clamping.

CO2: Infer and outline the functioning principles and devise the operational mechanism of BJT/FET Amplifiers.

CO3: Investigate and analyze a variety of feedback and oscillating circuits.

CO4: Classify and discuss the core concepts of differential, multi-stage and operational amplifiers in detail.

CO5: Illustrate the linear and nonlinear applications of operational amplifiers.

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CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	3	2	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	3	2	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	3	2	-
CO4	3	3	2	-	-	-	-	-	-	-	-	2	3	2	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	3	2	-

UNIT – I

Diode circuits: Open-circuited P-N Junction, Current Components in a p-n diode, I-V characteristics, temperature Dependence of the I-V characteristic, Zener Diode.

Rectifiers: Half wave, full wave and Bridge Rectifiers without filter and with inductor filter capacitor filter, L section &Π- section filters.

Clippers, Clampers: Positive and negative clippers - Positive and negative clampers.

UNIT – II

BJT circuits: NPN & PNP junction transistors, Transistor current components, CB Configuration, CE Configurations, CC configuration, BJT as a switch, BJT as an amplifier, BJT biasing circuits, Small signal equivalent circuits.

FET circuits: JFET, Pinch-off Voltage, volt-ampere characteristics, MOSFET structure and I-V characteristics, MOSFET as a switch, MOSFET as an amplifier, FET small signal model, CS / CD / CG configurations at low frequencies.

UNIT – III

Feedback Amplifiers: Feedback concept, Transfer Gain with Feedback, Negative feedback amplifiers and their characteristics.

Oscillators: Barkhausen criterion for sinusoidal oscillators, RC phase shift oscillator using BJT, General Form of Oscillator, Wien Bridge, Hartley, Colpitt's oscillators using BJT.

Differential, Multi-stage and operational amplifiers: Differential amplifier, multi-stage amplifiers, internal structure of an operational amplifier, deal op-amp, non-idealities in an op- amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

UNIT – IV

Linear applications of Op-amp: Idealized analysis of op-amp circuits. Inverting and non- inverting amplifier, instrumentation amplifier, integrator, differentiator, Voltage to current and current to voltage conversion.

Nonlinear applications of Op-amp: Basic comparator, Zero-crossing detector, Schmitt Trigger, Square-wave and triangular-wave generators, Absolute value output circuit, Peak detector, Sample and hold circuit, Precision rectifier.

TEXT BOOKS:

1. Jacob Millman and Christos C Halkias, Integrated Electronics Analog and Digital Circuits and Systems, Tata McGraw Hill, 2nd Edition, 2017.
2. Rama Kant A. Gayakwad, Op-Amps and Linear Integrated Circuits, Pearson education, 4th Edition, 2015.

REFERENCE BOOKS:

1. Theodore F Bogart Jr., Jeffrey S Beasley and Guillermo Rico, Electronic Devices and Circuits, Pearson Education, 6th Edition, 2004.
2. David A Bell, Electronic Devices and Circuits, Prentice Hall India, 5th Edition, 2018.
3. D.Roy and Choudhury, ShailB.Jain, Linear Integrated Circuits, New Age International, 4th Edition, 2017.
4. Robert L Boylested and Louis Nashelsky , Electronic Devices and Circuit Theory, Prentice Hall India,11thEdition, 2015.

NPTEL COURSE LINKS:

1. NPTEL::Electrical Engineering: Analog Electronic Circuits, https://nptel.ac.in/courses/108102112

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ELECTRICAL MACHINES – I
(DC MACHINES AND TRANSFORMERS)

II B.Tech – III Semester (Code: 18EE304)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics, Basic Mathematics

Course objectives: To make the students

- Demonstrate the concept of magnetic circuits and electromagnetic force and torque.
- Explain the construction of dc generators and its characteristics.
- Study the various speed control techniques and testing methods of dc motor.
- Explain the construction and operation of single and three phase Transformers.

Course Outcomes: At the end of this course, students will be able to

CO1: Illustrate the concepts of magnetic circuits.
CO2: Describe the operation of dc generators and its characteristics.
CO3: Demonstrate the speed control techniques and various testing methods of dc motors.
CO4: Assess the construction and operation of single phase and three phase Transformers.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	1-	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-

UNIT-I

Magnetic Fields and Magnetic circuits: Review of magnetic circuits-MMF, flux, reluctance, inductance; review of Ampere law and Biot- Savarts law. Visualization of magnetic fields produced by a bar magnet and a current carrying coil-through air and through a combination of iron and air.

Electromagnetic force and torque: B-H curve of magnetic materials; energy stored in magnetic circuit; Field energy and mechanical force-mechanical energy-Multiple excited magnetic field systems-Forces /Torques in systems with permanent magnets. Examples of

galvanometer coil-relay contact-lifting magnet-rotating element with eccentricity or saliency.

UNIT-II

DC Generators: Basic construction of a DC machine-Principle and operation of DC Generator-Types of windings- Types of field excitations-EMF equation-Armature reaction-commutation-Characteristics of all types of DC Generators-Applications of DC Generators- Parallel operation of DC Generators.

UNIT-III

DC Motors: Principle and operation of DC motor-Torque equation of DC motor-characteristics of all types of DC motors-starters and their design-speed control-Losses-Swinburne's test, load testing and back-to-back testing of DC machines.

UNIT-IV

Single phase Transformers: Principle, Construction and operation of single-phase transformer, equivalent circuit, phasor diagrams. Voltage Regulation, losses and efficiency. Testing's-OC and SC test, back-to back test, Separation of hysteresis and eddy current losses. **Three phase transformers:** Construction, types of connection and their comparative features. Parallel operation. Auto- transformers. Magnetizing current, effect of non-linear B- H curve of magnetic core material. Scott connection, tap changing transformers. Cooling of transformers.

TEXT BOOKS:

1. P.S.Bhimbra, Electric Machinery, Khanna Publications, 7th edition, 2011.
2. I.J.Nagrath & D.P.Kotari, Electric Machines, Tata Mc Graw-Hill Publication, 3rd edition, 2017.

REFERENCES BOOKS:

1. A.E. Fritzgerald, C. Kingsley & S. Umans –Electric Machinary, McGraw-Hill Companies, 6th editon 2017.
2. Samarjit Ghosh, Electrical Machines, Pearson 2nd edition, 2012.
3. J. B. Gupta, Theory & performance of Electric Machines, S.K. Kataria&Sons,15th edition, 2022.
4. M.G.Say, Performance and design of AC machines, CBS Publishers, 5th edition,2005.

NPTELCOURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Electrical Machines - I, https://nptel.ac.in/courses/108/105/108105155/
2. NPTEL :: Electrical Engineering - Electrical Machines -I, https://nptel.ac.in/courses/108/105/108105017/

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ENGINEERING MECHANICS

II B.Tech – III Semester (Code: 18CE003)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics

Course Objectives: To learn

- The concepts Force systems, free body diagrams, resultant of forces and equations of equilibrium, Supports and support reaction sand calculation of Centroid
- The Concept of moment of inertia of plane figures, Laws and applications of friction
- The Analysis of the truss and determination of axial forces by Method of Joints
- Motion of a body and their relationships and application of D Alembert's principle in rectilinear and curvilinear motions
- About Mass moment of inertia of material bodies, Plane motion of a body about a fixed axis

Course Outcomes: After the completion of this course, Students will be able to

CO1: Analyze the forces developed at the contact of the bodies by constructing the freebody diagram and location of centroid

CO2: Analyze the systems with friction, and M.I of composite figures .

CO3: Understanding of the principles of dynamics

CO4: Analyze of moment of inertia of material bodies and Rotation of rigid body about fixed axis

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-

UNIT – I

Concurrent Forces in a Plane: Principles of statics – composition and resolution of forces – equilibrium of concurrent forces in a plane –Method of moments.

Parallel Forces in a Plane: Two parallel forces – general case of parallel forces in a plane – center of parallel forces – Centroids of composite plane figures and curves.

UNIT – II

Moments of Inertia of Plane Figures: Moment of inertia of a plane figure with respect to an axis in its plane – Moment of Inertia with respect to an axis perpendicular to the plane of the

figure – Parallel axis theorem.

Friction: Characteristics of friction – problems involving dry friction, ladder friction and wedge friction.

UNIT – III

Rectilinear Translation: Kinematics of rectilinear motion – principles of dynamics – Differential equations of rectilinear motion D'Alemberts principle.

Curvilinear Translation: Kinematics of curvilinear motion – Differential equations of curvilinear motion – D'Alembert's principle.

UNIT – IV

Moments of Inertia of Material Bodies: Moment of inertia of rigid body – Moment of inertia of a lamina – Moments of inertia of three – dimensional bodies.

Rotation of a Rigid Body about a Fixed Axis: Kinematics of rotation – Equation of motion for a rigid body rotating about a fixed axis – D'Alembert's principle.

TEXT BOOKS:

1. S. Timoshenko and D. H. Young, "Engineering mechanics" Mc Graw-Hill International edition (For concepts and symbolic problems)
2. R. C. Hibbeler and Ashok Gupta, "Engineering mechanics statics and dynamics", Pearson (For numerical problems using S.I. system of units)

REFERENCE BOOKS

1. Beer and Johnston, "Vector mechanics for engineers statics and dynamics" Tata Mc Graw-Hill publishing company, NewDelhi
2. A. K. Tayal, "Engineering mechanics statics and dynamics" Umesh publication, Delhi (For numerical problems using S.I. system of units)

NPTEL COURSE LINKS:

1. NPTEL :: Mechanical Engineering - NOC:Engineering Mechanics
2. NPTEL :: Basic courses-Sem 1 and 2 - Engineering Mechanics

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TECHNICAL ENGLISH

II B.Tech – III Semester (Code: 18EL002)

Lectures	3	Tutorial	0	Practical	0	Credits	2
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: The course aims

- At enhancing the vocabulary competency of the students
- To introduce corrective measures to eliminate grammatical errors in speaking and writing
- To learn writing as a process, including various invention heuristics (such as brainstorming), gathering evidence, considering audience, drafting, revising, editing, and proofreading
- Use grammatical, stylistic, and mechanical formats and conventions appropriate for a variety ofpurposes
- Produce coherent, organized, readable prose for a variety of rhetorical situations

Course Outcomes : By the end of the course the student would be able to

CO1: Make use of contextual clues to infer meanings of unfamiliar words from context

CO2: Understand how to apply technical information and knowledge in practical documents for avariety of purposes

CO3: Use grammatical, stylistic, and mechanical formats and conventions appropriate to variousaudiences and disciplines

CO4: Build confidence to participate actively in writing activities (individually and in collaboration)that model effective technical communication in the workplace

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	2	3	2	2	-	-	2
CO2	-	-	-	-	-	-	-	2	2	3	2	2	-	-	2
CO3	-	-	-	-	-	-	-	2	2	3	2	2	-	-	2
CO4	-	-	-	-	-	-	-	2	2	3	2	2	-	-	2

UNIT-I

1.1 Vocabulary Development: Familiarising Idioms & Phrases
1.2 Grammar for Academic Writing: Making Requests
1.3 Language Development: Using Transition & Link words
1.4 Technical Writing: Letter Writing & Email Writing

UNIT-II

2.1 Vocabulary Development: Analogous words, Gender Sensitive language
2.2 Grammar for Academic Writing: Tenses: Simple Past /Present Perfect, The Future: Predicting& Proposing
2.3 Language Development: Cloze tests

2.4 Technical Writing: Technical Reports

UNIT-III

3.1 Vocabulary Development: Abbreviations& Acronyms
3.2 Grammar for Academic Writing: Describing(People/Things/Circumstances) : Adjectival &Adverbial groups
3.3 Language Development: Transcoding (Channel conversion from chart to text)
3.4 Technical Writing: Circular, Memos, Minutes of Meeting

UNIT-IV

4.1 Vocabulary Development: Corporate vocabulary
4.2 Grammar for Academic Writing: Inversions & Emphasis
4.3 Language Development: Reading Comprehension
4.4 Technical Writing: Resume

Reference Books

1. Communication Skills, Sanjay Kumar & Pushpa Latha. Oxford University Press: 2011.
2. Technical Communication Principles and Practice. Oxford University Press: 2014.
3. Advanced Language Practice, Michael Vince. MacMilan Publishers: 2003.
4. Objective English (Third Edition), Edgar Thorpe & Showick. Pearson Education: 2009
5. English Grammar: A University Course (Second Edition), Angela Downing & Philip Locke,Routledge Taylor & Francis Group: 2016

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II B.Tech – III Semester (Code: 18EEL31)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic of Electronic Devices and Circuits.

Course Objectives: To make the students

- Demonstrate the characteristics of Diodes and its diverse applications including rectifiers and clippers.
- Describe the characteristics of BJT, JFET & MOSFET in different biasing conditions.
- Develop multistage amplifiers and feedback amplifiers.
- Construct different types of oscillator circuits using BJT.
- Explore linear and nonlinear applications of Op-amp

Course Outcomes: After completion of this course, Students will be able to

CO1: Illustrate the characteristics of Diodes and its diverse applications including rectifiers and clippers.
CO2: Outline the characteristics of BJT, JFET & MOSFET in different biasing conditions.
CO3: Construct multistage amplifiers and feedback amplifiers.
CO4: Design of different types of oscillator circuits using BJT.
CO5: Conduct an experiment to explore linear and nonlinear applications of op-amps

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	-	-	-	-	3	2	-	1	3	2	2
CO2	3	3	3	3	-	-	-	-	3	2	-	1	3	2	2
CO3	3	3	3	3	-	-	-	-	3	2	-	1	3	2	2
CO4	3	3	3	3	-	-	-	-	3	2	-	1	3	2	2
CO5	3	3	3	3	-	-	-	-	3	2	-	1	3	2	2

LIST OF EXPERIMENTS:

1. Characteristics of PN Junction and Zener diode
2. Half wave rectifier with and without filter
3. Full wave rectifier with and without filter
4. Non-linear wave shaping – clippers
5. Characteristics of Transistor in Common Emitter configuration
6. Verification of Transistor Self Bias Circuit
7. Characteristics of Junction Field Effect Transistor
8. Characteristics of MOSFET

9. Two stage RC coupled Amplifier.
10. Design of voltage shunt feedback amplifier.
11. Design of RC phase shift oscillator.
12. Design of LC oscillator
13. Waveform generation using OP-AMP
14. Instrumentation amplifier using IC 741
15. Schmitt trigger using OP-AMP

Note: Minimum 10 experiments should be conducted.

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MEASUREMENT AND INSTRUMENTATION LAB

II B.Tech – III Semester (Code: 18EEL32)

Lectures	2	Tutorial	0	Practical	3	Credits	2
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Mathematics, Basic Electrical Engineering.

Course Objectives: To make the students

- To learn about characteristics of measuring instruments.
- To have an adequate knowledge in Calibration of measuring instruments.
- To have an adequate knowledge in errors in Bridges.
- To have an adequate knowledge in Sensors and Transducers.

Course Outcomes: After the completion of this course, students will be able to

CO1: Demonstrate various measurement devices, characteristics, operation and their limitations.

CO2: Illustrate the dynamic response and the calibration of few instruments.

CO3: Calibrate and validate DC and AC bridges.

CO4: Demonstrate the function of Various types of Transducers.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	3	-	-	-	-	3	2	-	-	3	2	-
CO2	3	3	-	3	-	-	-	-	3	2	-	-	3	2	-
CO3	3	3	-	3	-	-	-	-	3	2	-	-	3	2	-
CO4	3	3	-	3	-	-	-	-	3	2	-	-	3	2	-

UNIT-I

INTRODUCTION TO MEASUREMENT Elements of Generalized measurement system- Methods of measurement- Classification of instruments–Static & Dynamic characteristics of instruments-Mean, Standard deviation- Probability of errors-Types of error Accuracy, Precision, Sensitivity, Linearity, Resolution.

UNIT-II

ELECTRICAL MEASURING INSTRUMENT: Basic effects of electromechanical instruments–Ammeter and voltmeter–Moving coil–Moving Iron–Electro dynamo meter and induction type–Extension of range. Wattmeter–Dynamometer and induction type energy meter.

UNIT-III

BRIDGES**:** Measurement of resistance-Low Medium and High- AC bridges- Anderson's for L, Schering Bridge for C.

UNIT-IV

TRANSDUCERS: Temperature transducers-RTD, Thermistor, Thermocouple-Displacement transducer- LVDT, Pressure transducer- Strain gauge.

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List of Experiments

1) Measurement of a batch of resistors and estimating statistical parameters.
2) Measurement of Medium resistance using Wheatstone bridge.
3) Measurement of Inductance using an Anderson's bridge technique as well as LCR meter.
4) Measurement of Capacitance using Schering bridge technique as well as LCR meter.
5) Measurement of Low Resistance using Kelvin's double bridge.
6) Measurement of High resistance and Insulation resistance using Megger.
7) Measurement of dielectric strength of Transformer oil using oil testing kit.
8) Calibration of 1-phase energy meter using direct loading/ Phantom loading method.
9) Current Measurement using CT.
10) Study a Linear Variable Differential Transformer (LVDT) and use it in a simple experimental set up to measure a small displacement.
11) Study the characteristics of Resistance Temperature Detector (RTD)
12) Study the characteristics of a Thermistor.
13) Study the characteristics of a Thermocouple.
14) Study the characteristics of a Photo reflective sensor for Speed Measurement.
15) Measure the stress & strain using strain gauges mounted on cantilever beam.

Note: Minimum 10 experiments should be carried.

TEXT BOOKS:

1. K. Sawhney, Puneet Sawhney , A course in electrical and electronic measurements and instrumentation , Dhanpat rai &Co, 19th Revised 2014.
2. R.K. Rajput, Electrical & Electronics Measurements & Instrumentation, S. Chand and Company Ltd.

REFERENCE BOOKS:

1. 1.J.B. Gupta, A Course in Electrical & Electronics Measurement & Instrumentation, Kataria and Sons, Reprint 2013.
2. 2.D.V.S. Moorthy, Transducers & Instrumentation, Prentice Hall of India, 2nd Edition,2008.

3. 3.B.C. Nakra and K.K.Choudhry ,Instrumentation Measurement and Analysis,,Mc Graw Hill Education (India) Pvt.Ltd, 3rd Edition 2009.

NPTEL COURSE LINKS:

1. http://nptel.ac.in/courses/108105064/
2. http://nptel.ac.in/courses/112103174/10
3. https://swayam.gov.in/courses/4523-mechanical-measurement-system
4. https://swayam.gov.in/course/3764-industrial-instrumentation

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ELECTROMAGNETIC FIELDS

II B.Tech – IV Semester (Code: 18EE401)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics, Basic Mathematics

Course Objectives: To make the students

- To acquire knowledge in Electromagnetic field theory
- To provide a solid foundation in Electrostatics such as Dipole, Capacitance
- To attain familiarity in Boundary conditions and Magnetic field.
- To understand the relation between field theory and circuit theory.
- To identify the electromagnetic wave propagation in medium

Course Outcomes: After the completion of this course, students will be able to

CO1: Describe the fundamentals in Electromagnetic field theory.

CO2: Explain basics in Electrostatics such as Dipole, Capacitance.

CO3: Distinguish electric and magnetic properties of material media and Familiarity in Boundary conditions and Magnetic field.

CO4: Illustrate three-dimensional vector differential and integral concepts to solve real life electromagnetic field problems.

CO5: Describe the electromagnetic wave propagation in medium.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	-	2	3	2	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	3	2	-
CO3	3	3	2	-	-	-	-	-	-	-	-	2	3	2	-
CO4	2	2	2	-	-	-	-	-	-	-	-	2	3	2	-
CO5	3	3	3	-	-	-	-	-	-	-	-	2	3	2	-

UNIT – I

Electrostatics I: Introduction to Rectangular, Cylindrical and Spherical Coordinate systems. The experimental law of coulomb, Electric field intensity, Field due to a continuous volume charge distribution, Field of a line charge, sheet of charge. Electric Flux Density, Gauss's law , Applications of Gauss law, Divergence, Maxwell's First equation (Electrostatics), Energy expended in moving a point charge in an electric field, Definition of potential and potential difference. The potential field of a point charge, system of charges, potential gradient.

UNIT – II

Electrostatics II: Electric field intensity due to dipole and Energy density in electrostatic field. The nature of dielectric materials, boundary conditions for perfect dielectric materials. Capacitance. Several capacitance examples. Capacitance of a two-wire line. Derivations of Poisson's and Lap lace's equations, Examples of the solution of Laplace's equation. Current and current density, continuity of current, conductor properties and boundary conditions

UNIT – III

Steady Magnetic Field: Biot- Savart Law, Ampere's Circuital Law, Magnetic Flux and Magnetic Flux Density, The scalar and vector magnetic potentials. Magnetic Forces and Materials: Force on a moving charge, Force on a differential current element, Force between differential current elements, Force and torque on a closed circuit, The nature of magnetic materials, Magnetization and Permeability. Magnetic boundary conditions. Potential energy in magnetic fields.

UNIT – IV

Time Varying Fields and Maxwell's Equations: Faraday's law, Displacement current, Maxwell's equations in point form, integral form.

Concept of Uniform Plane Wave: Wave propagation in free space, dielectrics. Poynting theorem and wave power. Propagation in good conductors: skin effect. Reflection of uniform plane waves at normal incidence.

TEXT BOOKS:

1. W H Hayt, J A Buck , "Engineering Electromagnetics", 7th Edition TMH, 2006.
2. Mathew NO Sadiku, "Elements of Electromagnetics", Oxford University Press, 2003.
3. G S N Raju, "Electromagnetic Field Theory and transmission lines", 1st Edition, Pearson Education India, 2005.

REFERENCE BOOKS:

1. Joseph A Edminister, "Theory and Problems of Electromagnetics", 2nd Edition, Schaum's Outline Series, Mc-Graw Hill International, 1993
2. EC Jordan and KG Balmain, "Electromagnetic Waves and Radiating Systems", PHI 2003.

NPTEL COURSE LINKS:

1. Electrical Engineering - NOC:Electromagnetic theory - NPTEL **https://nptel.ac.in/courses/108/104/108104087/**
2. Electrical Engineering - Electromagnetic Fields - NPTEL **https://nptel.ac.in/courses/108/106/108106073/**

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DIGITAL ELECTRONICS
II B.Tech – IV Semester (Code: 18EE402)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics, Basic Mathematics

Course Objectives: To make the students at the end of the course

- Explain the fundamental concepts and techniques used in digital electronics, and Number conversions.
- Apply Boolean Algebra and able to minimize boolean expressions by applying boolean algebra, K-Map method and Tabulation Method with "don't care" conditions.
- Develop and design various combinational logic circuits.
- Use basic flip-flops SR, JK, D and T to design sequential circuits.
- Describe the fundamental concepts about various terms and circuits of A/D and D/A converters
- Classify different Programmable Logic Devices.

Course Outcomes: After the completion of this course, the students are able to

CO1: Describe fundamental concepts and techniques used in digital electronics, and able to perform Number conversions, Complements.

CO2: Simplify Boolean function using Boolean algebraic rules and laws, K-Map and Tabulation Method.

CO3: Deduce of various Combinational logic circuits.

CO4: Illustrate functionalities of Latches and Flip-Flops and design of Sequential logic circuits.

CO5: Explain about various terms of A/D and D/A converters.

CO6: Classification of memories and PLD's.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	3	2	2
CO2	3	3	2	-	-	-	-	-	-	-	-	-	3	2	2
CO3	3	3	2	-	-	-	-	-	-	-	-	-	3	2	2
CO4	3	3	2	-	-	-	-	-	-	-	-	-	3	2	2
CO5	3	3	2	-	-	-	-	-	-	-	-	-	3	2	2
CO6	3	3	2	-	-	-	-	-	-	-	-	-	3	2	2

UNIT-I

Fundamentals of Digital Systems and Logic families: Digital signals, digital Circuits, AND, OR, NOT, NAND, NOR a n d Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, Octal, hexa decimal number, binary arithmetic, one's and two's complements arithmetic, codes: Excess-3 and gray code, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

UNIT-II

Combinational Digital Circuits: Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, don't care conditions, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, Multiplexer, De-Multiplexer, digital comparator, parity checker/ generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT-III

Sequential circuits and systems : A1-bitmemory,thecircuit properties of Bi stable latch, the clocked SR flip flop, J-K, T and D- type flip flops, applications of flip flops, shift registers, applications of shift registers, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, applications of counters.

UNIT-IV

A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, sample and Hold Circuit, a n a l o g t o digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage of frequency and voltage to time conversion, specifications of A/D converters.

Semi-conductor memories and Programmable logic devices: Memory organization and operation, expanding memory size, classification and characteristics of memories, read only memory (ROM), read and write memory (RAM), ROM as a PLD, Programmable logic array, Programmable array logic.

TEXT BOOKS:

1. R.P. Jain, Kishor Sara"Modern Digital Electronics", Mc Graw Hill India, 5th edition, July 2022.
2. M. Morris Mano, "Digital logic and Computer design", Pearson India, 6th edition, 2018.

REFERENCE BOOKS:

1. Anil K. Maini, "Digital Electronics: Principles and Integrated Circuits", Wiley, 2007.
2. S.S. Bhatti Rahul Malhotra, "A Textbook of Digital Electronics", I K International Publishing House, 2011.
3. A.Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Digital Electronic Circuits, https://nptel.ac.in/courses/108/105/108105132/
2. NPTEL :: Electrical Engineering - NOC:Digital Circuits, https://nptel.ac.in/courses/108/105/108105113/

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ELECTRICAL MACHINES – II
(INDUCTION MOTORS AND SYNCHRONOUS MACHINES)

II B.Tech – IV Semester (Code: 18EE403)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics, Basic Mathematics

Course objectives: To make the students

- Understand the construction, operation and performance of three phase induction machines.
- Gain knowledge about construction, operation and application of single-phase induction machines.
- Understand the construction, operation and performance of Alternators.
- Gain knowledge about construction, operation and performance of synchronous motors.

Course Outcomes: At the end of this course, students will be able to

CO1: Demonstrate construction, operation and performance of three phase induction machines.

CO2: Describe the construction, operation and application of single-phase induction machines.

CO3: Assess operation and performance of Alternators

CO4: Illustrate operation and performance of synchronous motors.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	-	-	-	2	3	3	3
CO2	3	3	3	2	-	-	-	-	-	-	-	2	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	3	3
CO4	3	3	2	3	-	-	-	-	-	-	-	2	3	3	3

UNIT-I

Induction machines: Construction-Types (squirrel cage and slip ring)-rotating magnetic field in two phase & three phase systems-Torque equation-torque slip characteristics- equivalent circuit-phasor diagram-losses and efficiency- circle diagrams-starting methods and speed control-Induction generator.

UNIT-II

Single- phase Induction motors: Constructional features-double revolving field theory-equivalent circuit-determination of parameters-split phase-capacitor start and run-shaded pole motors-characteristics and their applications.

UNIT-III

Synchronous generators: Construction-EMF equation with winding factors-equivalent circuit and phasor diagram-armature reaction-synchronous impedance-voltage regulation-methods of determining regulation –EMF and ZPF methods-salient pole machine-two

reaction theory-power angle characteristics-parallel operation of alternators-synchronization of alternators.

UNIT-IV

Synchronous motors: Theory of operation-starting methods-phasor diagrams-variation of current and power factor with excitation-Power circles-V and inverted V curves-hunting and its prevention-synchronous condenser and its applications.

TEXT BOOKS:

1. P.S.Bhimbra, Electric Machinery, Khanna Publications, 7th edition, 2011.
2. I.J.Nagrath & D.P.Kotari, Electric Machines, Tata Mc Graw-Hill Publication, 3rd edition, 2017.

REFERENCES BOOKS:

1. A.E. Fritzgerald, C. Kingsley & S. Umans –Electric Machinary, McGraw-Hill Companies, 6th editon 2017.
2. Samarjit Ghosh, Electrical Machines, Pearson 2nd edition, 2012.
3. J. B. Gupta, Theory & performance of Electric Machines, S.K. Kataria&Sons,15th edition, 2022.
4. M.G.Say, Performance and design of AC machines, CBS Publishers, 5th edition,2005.
5. P.S. Bimbhra, Generalized Theory of Electrical Machines, Khanna Publication,7th edition 2021.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - Electrical Machines II, https://nptel.ac.in/courses/108/106/108106072/
2. NPTEL :: Electrical Engineering - NOC:Electrical Machines - II, https://nptel.ac.in/courses/108/105/108105131/

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SIGNALS AND SYSTEMS

II B.Tech – IV Semester (Code: 18EE404)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics, Basic Mathematics

Course objectives: To make the students

- Explain the concepts of continuous time and discrete time systems.
- Gain knowledge about LTI systems
- Learn about the concepts of systems in frequency domain.
- Describe sampling theorem and its implications.

Course Outcomes: At the end of this course, students will be able to

CO1: Explain the concepts of continuous time and discrete time systems.

CO2: Demonstrate and analyze continuous and discrete LTI systems, develop state space model.

CO3: Determine the frequency response of continuous and discrete time systems.

CO4: Illustrate sampling theorem and reconstruct of signals

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	1	3	2	2
CO2	3	3	2	-	-	-	-	-	-	-	-	1	3	2	2
CO3	3	3	2	-	-	-	-	-	-	-	-	1	3	2	2
CO4	3	3	2	-	-	-	-	-	-	-	-	1	3	2	2

UNIT-I

INTRODUCTION TO SIGNALS AND SYSTEMS: Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

UNIT-II

BEHAVIOR OF CONTINUOUS AND DISCRETE-TIME LTI SYSTEMS: Impulse response and step response, convolution, input-output behavior with a periodic convergent input, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

UNIT-III

FOURIER AND Z - TRANSFORMS: Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete- Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

UNIT-IV

SAMPLING AND RECONSTRUCTION: The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

TEXT BOOKS:

1. V. Oppenheim, A. S. Willsky and S. H. Nawab, Signals and Systems, Prentice Hall India, 2007.
2. Anand Kumar, Signals and Systems, Prentice Hall India Learning Private Limited, 3rd edition, 2016.

REFERENCE BOOKS:

1. J. G. Proakis and D. G. Manolakis, Digital Signal Processing: Principles, Algorithms, and Applications, Pearson, 2007.
2. H. P. Hsu, Signals and Systems , Schaum's Series, McGraw Hill Education, 3rd Edition 2013.
3. S. Haykin and B. V. Veen, Signals and Systems, John Wiley and Sons, 2nd Edition, 2007.
4. M. J. Robert, Fundamentals of Signals and Systems, McGraw Hill Education, 2007.
5. B. P. Lathi, Linear Systems and Signals, Oxford University Press, 3rd Edition, 2017.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Signals and Systems, https://nptel.ac.in/courses/1-8/1-6/1-81-6163/
2. NPTEL :: Electronics & Communication Engineering - Signals and Systems, https://nptel.ac.in/courses/117/1-1/1171-1-55/

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BIOLOGY FOR ENGINEERS

II B.Tech-IV Semester (18CE002)

Lectures	3	Tutorial	0	Practical	0	Credits	2
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course objectives: To make the students

- To describe the bio molecules, present in living organisms
- To give awareness about the sterilization methods
- it explains the importance of plants in the ecosystem
- it gives an idea about the classifications of organisms
- It explores the harmful and beneficial role of bacteria

Course Outcomes: After the completion of this course, students will be able to

CO1: Explain the Morphology and chemical composition of the cell and function of each organelle present in the cell with the help of microscope.

CO2: Explain the process of human physiological system and its cell functioning.

CO3: Explain the importance of microbiology and immunological science to know the reactions of our body.

CO4: Discuss the biological science related to the different disciplinary areas.

CO5: Explain the importance of genetics and how bioscience is related to other technical areas.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	1	2	2	1	-	-	-	-	-	-	-	-	-	-
CO4	-	1	2	-	2	-	-	-	-	-	-	-	-	-	-
CO5	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-

UNIT-I

Introduction to biology: Classification of microorganisms- Two kingdom, Three kingdom & Five kingdom; Prokaryotic cell structure (Bacteria); Eukaryotic cell structure (Plant & Animal cells); Differences between Prokaryotes and Eukaryotes.

UNIT-II

Bacterial Growth Phases; Nutrition in Bacteria; Types of media; Bacteria - Binary Fission, Endosporm Formation; Plant & Animal cell Division - Mitosis & Meiosis.

UNIT-III

Structure of DNA (Watson & Crick model); Types of DNA & Function of DNA; Structure of RNA & types of RNA; Differences between DNA & RNA. Types of proteins & structure of proteins.

UNIT-IV

Sterilization methods - Physical methods: Heat, Filtration, radiation; Chemical methods: Phenolics, alcohols, aldehydes, halogens, heavy metals, sterilizing gases, dyes. Economic importance of bacteria (Harmful & Beneficial aspects); Plants in Primary Health care - Tulasi, piper longum, Myrobalan, Aloe vera, Turmeric.

REFERENCE BOOKS:

1. Prof. K.yadagiri., Dr. M. Manikya Lakshmi, "Botany" paper-I,II,III,IV (Telugu Akademi Coordinating Committee)
2. Presscott, "Microbiology"
3. Pelczar, "Microbiology"
4. Ananthanarayana, "Microbiology"

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POWER SYSTEM – I
(GENERATION and TRANSMISSION)

II B.Tech-IV Semester (18EE406)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

- Discuss the economical aspects and choice of power stations and units.
- Infer the significance of conventional and non-conventional energy resources and their operation.
- Calculate transmission line parameters.
- Discuss the theory and mechanical design of transmission lines and introduce various types of insulators and their testing.

Course Outcomes: After completion of this course, Students will be able to

CO1: Explain the economic aspects and choice of power stations and units.
CO2: Examine the significance of conventional and non-conventional energy resources and their operation.
CO3: Calculate the parameters of Transmission line and describe the performance of different types of transmission line.
CO4: Demonstrate the types of insulators, their efficiency calculation and study about mechanical design of transmission lines

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	3	3	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	3	3	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	3	3	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	3	3	-

UNIT-I

Economical Aspects: Economics of generation - factors affecting cost of generation - Definitions: load factor – diversity factor – plant use factor - reduction of cost by inter connected stations. Power factor considerations – causes of low power factor – methods of improving power factor – phase advancing and generation of reactive KVAR – most economical power factor for constant KW load and constant KVA type loads. Tariff: Characteristics of Tariff – types of Tariffs.

Choice of power stations and units: Types of power stations – choice of generation - size of generator units – load duration curve – effect of variable load on plant operation and design.

UNIT-II

Thermal Power: Block Diagram of Thermal Power Station (TPS), Brief Description of Thermal Power system Components

Hydro Power: Selection of Site, Classification, Layout, Description of Main Components. **Nuclear Power**: Nuclear Fission and Chain Reaction-Principle of Operation of Nuclear Reactor.- Description of Main Components.

Solar Power Generation: Role and Potential of Solar Energy Options, Principles of Solar Radiation, Solar Energy Collectors, Different Methods of Energy Storage – PV Cell- V-I Characteristics.

Wind Power Generation: Role and potential of Wind Energy Options, Horizontal and Vertical Axis Wind Mills- Performance Characteristics-Pitch & Yaw Controls – Economic Aspects.

UNIT-III

Transmission Line Parameters: Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines.

Modeling of Transmission Lines: Classification of Transmission Lines - Short, medium and long line and their model - representations - Nominal-T, Nominal-Pie and A, B, C, D Constants. Mathematical Solutions to estimate regulation and efficiency of all types of lines- Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations – Representation of Long lines – Equivalent T and Equivalent – π, Numerical Problems. – Surge Impedance and surge Impedance loading - wavelengths and Velocity of propagation – Ferranti effect, Charging current, Need of Shunt Compensation.

UNIT-IV

Insulators, Corona: Types of Insulators- String efficiency and Methods for improvement– Voltage Distribution, Calculation of string efficiency- Capacitance grading and Static shielding. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

Mechanical Design of Lines: Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor - Stringing chart and sag template and its applications.

TEXT BOOKS:

1. Electrical power systems, C.L.Wadhwa, New Age International (P) Limited, 6th Edition, 2010, Reprint 2014.
2. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2004.

REFERENCE BOOKS:

1. Electric Power Generation Distribution and Utilization by C.L Wadhwa, New Age International (P) Ltd., 2005.
2. Renewable Energy Resources – John Twidell and Tony Weir, Taylor and Francis Group, Second Edition, 2006
3. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
4. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND & COMPANY LTD., New Delhi, ISBN-10. 9788121924962,2004.
5. Power System Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill Education (India) Pvt. Ltd., 2nd Edition, 2008, 23rd Reprint 2015.

NPTEL Course Links:

1. **NPTEL :: Electrical Engineering - Power System Generation, Transmission and Distribution (Encapsulated from earlier Video), https://nptel.ac.in/courses/108/102/108102047/**
2. **NPTEL :: Electrical Engineering - NOC:Power System Engineering, https://nptel.ac.in/courses/108/105/108105104/**
3. **NPTEL :: Introduction to power system analysis, https://nptel.ac.in/courses/108/105/108105067/**

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DIGITAL ELECTRONICS LAB

II B.Tech – IV Semester (Code: 18EEL$\bar{4}$1)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

- Design and verify different types of logic gates using universal gates.
- Design of combinational logic circuits like adders, subtractions, code converters, MUX and DEMUX.
- Design of sequential logic circuits like flip-flops, counters and registers.
- Design and test applications of 555 timer circuits and D/A converters.

Course Outcomes: After completion of this course, Students will be able to

CO1: Verify different types of logic gates using discrete components and universal building blocks.

CO2: Build different types of combinational logic circuits using logic gates.

CO3: Develop different counters and registers using flip-flops.

CO4: Design of 555 timer circuits and D/A converters

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	3	2	-	-	3	2	2
CO2	3	3	2	2	-	-	-	-	3	2	-	-	3	2	2
CO3	3	3	2	2	-	-	-	-	3	2	-	-	3	2	2
CO4	3	3	2	2	-	-	-	-	3	2	-	-	3	2	2

LIST OF EXPERIMENTS

1. Realization of Logic Gates using Discrete Components
2. Realization of Logic Gates using Universal Building Blocks.
3. Design of Combinational Logic Circuits like half-adder, Full adder, Half-subtractor and Full-subtractor
4. Design of Code converters.
5. Design of combinational circuit for BCD to decimal conversion to drive 7-segment display driver.
6. Design of 4X1 Multiplexer and 1x4 Demultiplexer.
7. Four-bit parity generator and comparator circuits.
8. Realization of RS-JK & D flip-flop using logic gates.

9. Design of Shift Registers.
10. Design of Ring Counter and Johnson Counter using Flip Flops
11. Design of Asynchronous counter, Mod counter, Up counter, Down counter and Up/Down counter using Flip Flops
12. Design of Synchronous Counter, Mod Counter, Up counter, Down counter and Up/Down counter using Flip Flops.
13. Design of Sequence Generators.
14. Design and testing of mono stable and Astable Multivibrators using 555 timers.
15. Design a 4-bit R-2R ladder type of digital to analog converter.

Note: Minimum 10 experiments should be conducted.

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ELECTRICAL MACHINES LAB - I

II B.Tech – IV Semester (Code: 18EEL42)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

- To develop experimental setups for studying the performance and operation of DC Generators and DC motors.
- To perform Direct and Indirect tests of various DC motors.
- Acquire hands on experience of conducting various tests on Transformers and obtaining their Performance indices using standard analytical as well as graphical methods.
- To develop experimental setups for studying the performance and operation of Transformers.

Course Outcomes: After the completion of this course, students will be able to

CO1: Compare the performance characteristics of DC Generators.
CO2: Examine the performance of the given DC motors.
CO3: Estimate the performance of single-phase transformer.
CO4: Evaluate the performance of transformers under various conditions.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	3	-	-	-	-	3	2	-	2	3	3	-
CO2	3	3	2	3	-	-	-	-	3	2	-	2	3	3	-
CO3	3	3	2	3	-	-	-	-	3	2	-	2	3	3	-
CO4	3	3	2	3	-	-	-	-	3	2	-	2	3	3	-

LIST OF EXPERIMENTS

1. Open circuit characteristics of separately excited / self-excited D.C shunt generator
2. Load test on D.C Shunt Generator
3. Load test on D.C series generator
4. Load test on D.C Compound Generator
5. Brake test on D.C Shunt Motor
6. Speed control of DC Shunt motor

7. Swinburne's Test on a D.C Shunt Machine.
8. Retardation test on D.C. Machine.
9. Field test on two identical DC series machine
10. Hopkinson's test on Two Identical D.C Machines
11. OC & SC tests on single - phase transformer
12. Load test on single - phase transformer
13. Scott Connection of Transformers
14. Parallel Operation of Two Single - Phase Transformers
15. Sumpner's test on two single-phase Transformers
16. Separation of losses in single – phase transformer

Note: Minimum 10 experiments should be carried out.

LERARNING RESOURCES:

1. P.S. Bhimbra, Electric Machinery, Khanna Publications, 7th edition,2011.
2. I.J. Nagrath & D.P. Kothari,Electric Machines,Tata McGraw Hill,5th edition,2017.

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DATA STRUCTURES AND ALGORITHMS LAB

II B.Tech – IV Semester (Code: 18ITL01)

Lectures	2	Tutorial	0	Practical	3	Credits	2
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Problem Solving with Programming.

Course Objectives: To make the students

- To impart the basic concepts of data structures and algorithms.
- To apply concepts about searching and sorting techniques
- To solve basic concepts about stacks, queues, lists, trees and graphs.
- To enable them to write algorithms for solving problems with the help of fundamental data structures.

Course Outcomes: After the completion of this course, students will be able to

CO1: Implement ADTs of different types of linked lists and applications.
CO2: Implement stack and queue ADT's using arrays and their applications.
CO3: Construct and implement different tree algorithms.
CO4: Implement various hashing techniques and Graph traversal methods.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	2	-	2	-	-	-	3	2	-	2	3	2	-
CO2	3	3	3	-	2	-	-	-	3	2	-	2	3	2	-
CO3	1	3	2	-	2	-	-	-	3	2	-	2	2	1	-
CO4	1	2	3	-	2	-	-	-	3	2	-	2	2	1	-

LIST OF EXPERIMENTS:

1. Write a program to perform the following operations on Array List.

   a) Creation b) Insertion c) Deletion d) Search e) Display.

2. Write a program to implement the following

   a) stack using array b) queue using array

3. Write a program to implement the following using stack.

   a) infix to postfix conversion b) postfix evaluation

4. Write a program to implement circular queue and perform the following

   a) enqueue b) dequeue

5. Write a program to perform the following operations on Single Linked List.

   a) Creation b) Insertion c) Deletion d) Search e) Display

6. Write a program to perform the following operations on Circular Single Linked List.

   a) Creation b) Insertion c) Deletion d) Search e) Display

7. Write a program to perform the following operations on Doubly Linked List.

   a) Creation b) Insertion c) Deletion d) Search e) Display

8. Write a program to implement the following sorting techniques

   a) Quick Sort b) Merge Sort c) Shell Sort

9. Write a program to demonstrate Binary Expression tree.

10. Write a program to create Binary tree and display their traversals.

TEXT BOOKS:

1. Mark Allen Weiss. Data Structures and Algorithm Analysis in C. Pearson Education, 2 edition, 2013. ISBN 978-81-7758-358-8.

REFERENCES:

1. M.J.Augeustein Y.Langsam and A.M.Tenenbaum. Data Structures Using C. Pearson Education Asia, 2 edition, 2006. ISBN 81-203-1177-9

2. Behrouz A. Forouzan Richard F.Gilberg. Data Structures – A Pseudocode Approach with C. ThomsonBrooks / COLE, 2 edition, 1998. ISBN 978-0-534-39080-8

3. J.E. Hopcroft Alfred Aho and J.D. Ullman. *Data Structures and Algorithms*. Pearson Education Asia, 1 edition, 1983. ISBN 978-0201000238

NPTEL COURSE LINKS:

1. NPTEL :: Computer Science and Engineering - NOC:Programming, Data Structures and Algorithms
2. NPTEL :: Computer Science and Engineering - Data Structures And Algorithms

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POWER SYSTEM – II

III B.Tech-V Semester (18EE501)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Circuit Theory, Network Analysis

Course Objectives: To make the students

- Analyze copper efficiencies of various supply systems and substation practice
- Describe the types of underground cables and explains the representation of power system components
- Understand the symmetrical components and networks and analysis of Unsymmetrical faults.
- Understand travelling waves and transmission lines over voltages.

Course outcomes: At the end of this course, students will be able to

CO1: Explain all types of DC and AC distribution systems, classification of substations.

CO2: Assess performance of underground cables and solve all power system problems using per unit system.

CO3: Illustrate all the power system networks with symmetrical and asymmetrical fault analysis

CO4: Classify the types of insulators, testing of insulators and calculation of string efficiency.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	2	2
CO2	3	3	2	1	-	-	-	-	-	-	-	-	3	2	2
CO3	3	3	2	3	-	-	2	-	-	-	-	-	3	2	2
CO4	3	3	2	2	-	-	1	-	-	-	-	-	3	2	2

UNIT – I

Distribution: Comparison of copper efficiencies between DC, AC Single phase, 3-phase, 3- wire & 4-wire systems, calculation of voltage regulation in case of non-uniform and uniformly distributed loads on feeders, feeders fed at one end and both ends, ring feeders without and with interconnections, choice of voltage and frequency, Kelvin's law for most economical cross section and most economical current density and its limitations.

Substation Practice: Classification of substations, indoor and outdoor substations, bus-bar arrangements – single bus-bar, sectionalized single bus-bar, main and transfer

bus-bar system, sectionalized double bus-bar system, ring mains, group switching,

UNIT – II

Underground Cables: Types of cables, laying of cables, insulation resistance, electric stress and capacitance of single core cable, use of inter sheath, capacitance grading, capacitance of three core belted type cable, stress in a three-core cable, sheath effects, currents in bonded sheaths, electrical equivalent of sheath circuit, thermal characteristics of cables.

Representation of power system Components: Modeling of power system components for system studies: transmission lines, two-winding transformers with nominal & off-nominal ratio tap settings, three-winding transformers, phase shifting transformers. One line diagram, Impedance and Reactance diagrams, advantages of Per Unit Computations, per unit quantities, changing the base, selection of base, per-unit impedances of three winding transformers.

UNIT-III

Symmetrical Faults: Transients in RL series circuit, short-circuit currents and reactance's of synchronous machines, internal voltages of loaded machines under transient conditions, selection of circuit breakers. Formation of Bus Impedance matrix by using Z-Bus building algorithm. Analysis of symmetrical faults using bus impedance matrix

Symmetrical components and Networks: Introduction – operator 'a', resolution of three unbalanced phasor into symmetrical components, power in terms of symmetrical components. Unsymmetrical series impedance - sequence impedances and sequence networks of unloaded generators, circuit elements. Positive, negative and zero sequence networks.

Unsymmetrical Faults: Single line to ground, line to line and double line to ground faults on an unloaded alternator and on power systems.

UNIT-IV

Travelling waves on Transmission lines and over voltages: Wave equation, Surge impedance and wave velocity, Reflection and Refraction of waves, Typical cases of line terminations, forked line, successive Reflection, Bewley Lattice diagram, Attenuation and Distortion, Arcing grounds, Capacitance switching and Current chopping.

Over Voltages: Lightning Phenomenon, over voltages due to lightning, Switching Over voltages, protection of systems against surges and Surge Arresters.

TEXT BOOKS:

1. Pradip Kumar Sadhu, Soumya Das, "Elements of Power Systems", CRC Press, 1st Edition, 2015.
2. John J. Grainer, W D Stevenson Jr, "Power System Analysis", McGraw Hill Education, 1st edition, 2017

3. D P Kothari, I J Nagrath, "Power System Engineering", McGraw-Hill Education, 3rd Edition, 2019

REFERENCE BOOKS:

1. S. Ramar, S. Kuruseelan, "Power System Analysis", PHI Learning Pvt. Ltd., 2013
2. S.N.Singh., "Electrical Power Generation, Transmission and Distribution", PHI, 2nd Edition, 2008.
3. C.L. Wadhwa, "Electrical Power Systems", New age International (P) Limited, 7th edition,2016.

NPTEL COURSE Links:

1. Electrical Engineering - Power System Analysis - NPTEL https://nptel.ac.in/courses/108/105/108105067/
2. **NPTEL :: Electrical Engineering - Power System Generation, Transmission and Distribution (Encapsulated from earlier Video), https://nptel.ac.in/courses/108/102/108102047/**
3. Electrical Engineering - NOC:Power System ... - NPTEL https://nptel.ac.in/courses/108/105/108105104/
4. Electrical Engineering - NOC:Electrical Distribution ... - NPTEL, https://nptel.ac.in/courses/108/107/108107112/

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CONTROL SYSTEMS

III B.Tech-V Semester (Code: 18EE502)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Mathematics, Physics, Network Theory

Course Objectives: To make the students

- To make the students interpret different physical systems, construct mathematical models and reduce a block diagram of multiple subsystems to a signal block.
- To make the students employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.
- To make the students analyze the system stability using complex domain.
- To make the students formulate different types of analysis in time and frequency domain.
- To make the students Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.
- To make the students assess controllability and observability of control systems.

COURSE OUTCOMES: After completion of this course, Students will be able to

CO1: Illustrate the concepts of classification of control systems, develop of mathematical models from schematics of physical system and reduce a block diagram of multiple subsystems to a signal block

CO2: Describe time domain analysis and predict the performance parameters of the system for standard input functions.

CO3: Compute stability of the system in complex domain.

CO4: Demonstrate stability of the system in time and frequency domain.

CO5: Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.

CO6: Assess controllability and observability of control systems.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	-	-	-	-	-	2	3	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	2	3	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	2	3	3	3
CO4	3	3	2	2	-	-	2	-	-	-	-	2	3	3	3
CO5	3	3	2	2	-	-	2	-	-	-	-	2	3	3	3
CO6	3	3	2	2	-	-	-	-	-	-	-	2	2	-	-

UNIT – I

Introduction: Basic concept of control system. Types of feedback control systems and its effect on overall gain – Liner time invariant, time variant systems and nonlinear control systems

Modeling of LTI Systems: Mathematical models and Transfer functions of Physical systems. Block diagram representation of control systems – signal flow graph.

UNIT – II

Time Domain Analysis: Standard test signals – step, ramp, parabolic and impulse response function –Time response of first order and second order systems to standard test signals - steady state response – error Constants. Effect of adding poles and zeros on overshoot, rise time, band width.

Stability Analysis in the Complex Plane: Absolute, relative, conditional, bounded input –bounded output, zero input stability, conditions for stability, Routh –Hurwitz criterion.

UNIT – III

Root Locus Technique: Introduction - Construction of Root Locus, Introduction to Controller Design using Root-loci method of feedback controller design.

Frequency Domain Analysis: Introduction – correlation between time and frequency responses– Polar plots – Bode plots – Nyquist plots.

UNIT – IV

Design of controllers and compensator: Introduction to Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs.

State space analysis: Concepts of state variables and state models – diagonalization – solutionof state equations – Concepts of controllability and Observability.

TEXT BOOKS:

1. I. J. Nagrath and M. Gopal, Control Systems Engineering, New Age International Pvt Ltd, 6th Edition 2018.
2. Control Systems Engineering by SK Bhattacharya, Pearson Education India,3rdEdition, 2013.

REFERENCE BOOKS:

1. A. Anand Kumar, “Control Systems”, Prentice Hall India Learning Private Limited, 2nd Edition, 2014.
2. Katsuhiko Ogata, “Modern Control Engineering”, Prentice Hall of India Pvt. Ltd., 5th Edition, 2015.
3. A. NagoorKani, “Control Systems”, RBA publications, 1st Edition, 2014.

4. Joseph Distefano, Allen Stubberud, Ivan Williams & Sanjoy Mandal, "Control Systems (Schaum's Outline Series)", McGraw Hill Education, 3rd Edition, 2017.

NPTEL COURSE LINKS:

1. NPTEL: Electrical Engineering - NOC: Control, engineeringhttps://nptel.ac.in/courses/108/ 106/ 108106098/
2. NPTEL :: Electrical Engineering - Control Engineeringhttps://nptel.ac.in/courses/108/102/108102043/
3. NPTEL :: Electrical Engineering - Control Engineeringhttps://nptel.ac.in/courses/108/102/108102044/
4. NPTEL :: Engineering Design - NOC: Control systemshttps://nptel.ac.in/courses/107/106/107106081/

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POWER ELECTRONICS

III B.Tech-V Semester (Code: 18EE503)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Semiconductor Physics and Nano Materials (18PH003)

Course Objectives: To make the students

- Discuss the thyristor and its family devices, ratings and protection.
- Explain AC to DC Conversion circuits with various loads
- Outline the operation of inverters PWM techniques.
- Study the operation of DC-DC choppers and AC Voltage controllers.

Course outcomes: At the end of this course, students will be able to

CO1: Demonstrate the basic operation and compare performance of various power semiconductor devices, passive components and switching circuits.

CO2: Categorise the performance of AC to DC Conversion circuits with different loads.

CO3: Outline the operation of inverters and PWM techniques.

CO4: Illustrate the operation of DC-DC choppers and AC Voltage controllers.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	-	-	-	-	-	-	-	3	3	2	-
CO2	3	3	3	2	-	-	-	-	-	-	-	3	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	3	3	3	3

UNIT-I

Introduction to Power Electronics devices and protection: Thyristor family devices, principle of operation, Snubber designs, selection and protection, Firing circuits, Commutation, MOSFET, IGBT operation, principles and ratings.

UNIT-II

AC to DC conversion: Uncontrolled, semi-controlled, fully controlled and dual converters in single-phase and three phase configurations operation with R, R-L, back emf load, Issues of line current harmonics, Power factor, Distortion factor of ac to dc converters and effect of source inductance.

UNIT-III

Inverters: Basics of dc to ac conversion, inverter circuit configurations and principle of operation, VSI and CSI, single and three-phase configurations, Single, Multiple, Square wave and sinusoidal PWM control methods and harmonic control.

UNIT-IV

DC-DC Converters and AC-AC Converters: Introduction to dc-dc conversion, various topologies, buck, boost, buck-boost converters. Introduction to ac to ac conversion, single phase and three-phase ac voltage controller circuit configuration with R load Analysis. Cyclo-converters: single-phase, three-phase to single-phase circuit configuration.

TEXT BOOKS:

1. M. H. Rashid, Pearson, Power electronics: circuits, devices, and applications, Pearson India Education Services Pvt.Ltd, 4th Edition, 2017.
2. M.D.Singh and Khanchandani, Power Electronics, Mc Graw Hill, 2nd Edition, 2017.

REFERENCE BOOKS:

1. R.W.Erickson, Fundamentals of Power Electronics, Springer; 1st Edition, 2013.
2. L. Umanand, Power Electronics: Essentials and Applications, Wiley India, 1st Edition, 2009.
3. P.S. Bhimbra, Power Electronics, Khanna Publications, 6th Edition, 2018.
4. N. Mohan and T. M. Undeland, Power Electronics: Converters, Applications and Design, John Wiley & Sons, 3rd Edition, 2007.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - Power Electronics
2. NPTEL :: Electrical Engineering - NOC:Power Electronics

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MICROPROCESSORS AND MICROCONTROLLER

III B.Tech – V Semester (Code: 18EE504)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Digital Electronics

Course Objectives: To make the students

- Learn the Architecture of 8085 and 8086 microprocessor.
- Explain the detail aspects of I/O and Interfacing circuits.
- Study the Architecture of 8051microcontroller.
- Study about 8051 micro controller interfacing with various applications.

Course Outcomes: At the end of this course, students will be able to

CO1: Execute the programs in 8086 microprocessor using assembly language Programming.
CO2: Illustrate various applications by interfacing programmable I/O devices.
CO3: Demonstrate the architecture of 8051 microcontroller and develop assembly language programs.
CO4: Illustrate various applications using 8051 microcontrollers.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	1	1	-	-	-	-	-	-	2	2	2	-
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2	-
CO3	3	3	3	3	3	-	-	-	-	-	-	2	2	2	-
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	2	-

UNIT – I

8086 Microprocessor: Introduction to 8085 Microprocessor and its Architecture, 8086Microprocessor Family, 8086 Internal Architecture, Pins and Signals, Instruction set and Assembler directives. Introduction to Programming: 8086Assembly Language Programming, Implementing standard Program Structures, Strings, Procedures and Macros.

UNIT – II

Interfacing Devices & Applications: 8255 Programmable Peripheral Interface, keyboard interfacing and 7-segment display interfacing, 8279 Programmable Keyboard Display Interface 8253 Programmable Interval Timer, 8259 Programmable Interrupt Controller, Direct Memory Access (DMA) and 8257DMA Controller, 8251 and serial I/O and Data Communication.

UNIT – III

8051 Microcontroller: Architecture of 8051, Special Function Registers, I/O Ports, Memory Organization, Addressing modes, Instruction set, Assembly Language Programming, Assembly Code for Arithmetic and Logic Operations.

UNIT – IV

Microcontroller Interfacing & Applications: Programming 8051 Timers, Timer programming, Serial Port Programming, Interrupts Programming, LCD and Keyboard Interfacing, ADC, DAC and Sensor Interfacing, External Memory Interface, Stepper Motor and Waveform generation.

TEXT BOOKS:

1. Ramesh Goankar, "Microprocessor Architecture, Programming, and Applications with the 8085",Penram International Publishing, 6th Edition, 2013.
2. D. V. Hall, "Microprocessors & Interfacing", McGraw Hill Higher Education, 3rd Edition, 2017.

REFERENCE BOOKS:

3. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088Family - Architecture, Programming and Design", 2nd Edition, Prentice Hallof India, 2007.
4. K. J. Ayala, "8051 Microcontroller", Delmar Cengage Learning, 3rd Edition, 2007.
5. K. M. Bhurchandi and A K Ray, "Advanced Microprocessors and Peripherals", McGraw Hill, 3rd edition, 2017.
6. M. A.Mazidi, J. G. Mazidi and R. D. McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", 2nd Edition, Pearson Education, 2011.

NPTEL COUIRSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Microprocessors And Microcontrollers
2. NPTEL :: Electronics & Communication Engineering - Microcontrollers and Applications
3. NPTEL :: Computer Science and Engineering - Microprocessors and Microcontrollers

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INDIAN TRADITIONAL KNOWLEDGE
III B.Tech – V Semester (Code: 18HS002)

Lectures	3	Tutorial	0	Practical	0	Credits	0
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: NIL

Course Outline: This Course is to facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian traditional knowledge systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian knowledge system, Indian perspective of modern scientific world-view and basic principles of yoga and holistic healthcare system.

Course Outcomes: After completion of the course, students will be able to:

CO1: Explain the concept of Indian Traditional knowledge and its importance.
CO2: Compare the Indian traditional knowledge Systems with Other Global systems.
CO3: Describe the concept of yoga and its correlations to science.
CO4: Study various case studies related to traditional knowledge.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	2	2	1	-	-	-	1	-	-	-
CO2	-	-	-	-	-	2	2	-	-	-	-	1	-	-	-
CO3	-	-	-	-	-	1	1	-	-	-	-	1	-	-	-
CO4	-	-	-	-	-	2	-	-	-	-	-	2	-	-	-

UNIT I

Basic Structure of Indian Knowledge System (i) वेद, (ii) उपवेद (आयुर्वेद, धनुर्वेद, गन्धर्वेद, स्थापत्य आदि) (iii) वेदांग (शिक्षा, कल्प, निरुत, व्याकरण, ज्योतिष छंद), (iv) उपाइग (धर्म शास्त्र, मीमांसा, पुराण, तर्कशास्त्र)

UNIT II

Modern Science and Indian Knowledge System

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge Vs indigenous knowledge, traditional knowledge Vs western knowledge, traditional knowledge Vs formal knowledge

UNIT III

Yoga and Holistic Health care

Science of Yoga , Yoga as a tool for healthy Life style , 8 limbs of Yoga (Yama , Niyama , Aasana , Pranayama , Pratyahara , Dharana , Dhyana , Samadhi).

UNIT IV

Case Studies

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment.

TEXT BOOKS:

1. Swami jitatmanand, “Modern Physics and Vedant, Bharatiya Vidya Bhavan Fritzof Capra”, Tao of Physics.Fritzof Capra, The wave of life.
2. G N Jha, (ENG. Trans.), Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasam, Delhi, 2-16.

REFERENCE BOOKS:

1. V. Sivaramakrishna (Ed.), “Cultural Heritage of India-Course material”, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.
2. Basanta Kumar Mohanta and Vipin Kumar Singh, “Traditional Knowledge System and Technology in India”, Pratibha Prakashan 2012.
3. Amit Jha, “Traditional Knowledge System in India” Atlantic publishers, 2002.
4. V N Jha(Eng. Trans.), “Tarkasangraha of Annam Bhatta”, International Chinmay Foundation, Vellarnad, Amaku, am.
5. “Yoga Sutra of Patanjali”, Ramakrishna Mission, Kolkatta.
6. R N Jha, Science of consciousness Psychotherapy and yoga practices, Vidyanidhiprakasham, Delhi, 2016.
7. P R Sharma (English translation), Shodashang Hridayam.

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PROFFSSIONAL ETHICS AND HUMAN VALUES

III B.Tech –Vth Semester (Code: 18EE506)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives (COs): To make the student

- Illustrate the importance of ethics and human values in life and society, moral awareness.
- Build ethics to engineering profession, Explain moral development, and importance of ethical theories.
- Demonstrate the Engineers as responsible experimenters, assessment of safety and risk, employee rights and professional rights.
- Shape themselves into valuable professionals, follow ethics and are able to solve their ethical dilemmas.

Course Outcomes: At the end of this course, students will be able to

CO1: Explain objectives of ethics and human values that ought to guide the engineering profession.

CO2: Develop work ethics in the profession and in society and resolves the moral issues in the profession and moral development.

CO3: Demonstrate the Engineers as responsible experimenters, assessment of safety and risk, employee rights and professional rights.

CO4: Describe Shape themselves into valuable professionals, follow ethics and are able to solve their ethical dilemmas.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	3	3	2	-	2	-	-	-
CO2	-	-	-	-	-	-	-	3	3	2	-	2	-	-	-
CO3	-	-	-	-	-	-	-	3	3	2	-	2	-	-	-
CO4	-	-	-	-	-	-	-	3	3	2	-	2	-	-	-

UNIT – 1

Morals, values and Ethics: Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT -II

Senses of Engineering Ethics: Variety of moral issues – Types of inquiry – Moral dilemmas Moral Autonomy – Kohlberg's theory – Gilligan"s theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT – III

Engineering as Social Experimentation: Engineering as Experimentation, Engineers as Responsible Experimenters, Codes of Ethics, Safety, Responsibility and Rights: Safety and Risk– Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk. Collegiality and Loyalty, Respect For Authority, Collective Bargaining Confidentiality, Conflicts Of Interest, Occupational Crime, Professional Rights Employee Rights,

UNIT – IV

Global Issues: Multinational Corporations, Environmental Ethics, Computer Ethics, Engineers as Managers, Consulting Engineering, Engineering as Expert Witnesses and Advisors. Intellectual Property Rights (IPR) – Discrimination.

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, Introduction to Engineering Ethics, Mc Graw Hill, 2nd Edition, 2010.
2. M. Govindarajan, S. Natarajan, V. S. Senthil kumar, "Professional Ethics and Human Values", PHI Learning Pvt Ltd., 2013.
3. Charles E Harris, Michael S Pritchard and Michael J Robins, "Engineering Ethics", 6th edition, 2017.

REFERENCE BOOKS:

1. Charles D Fleddermann, "Engineering Ethics", Pearson Prentice Hall, 2008.
2. John R Boatright, "Ethics and The Conduct of Business", Pearson, 8th Edition, 2016.
3. Edmund G Seebauer And Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2000

NPTEL VIDEO LINKS:

1.https://nptel.ac.in/courses/109/106/109106117/
2.https://nptel.ac.in/courses/110/105/110105097/

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ELECTRICAL MACHINES LAB – II

III B.Tech – V Semester (Code: 18EEL51)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objective: To make the students.

- Develop experimental setups for studying the performance and operation of squirrelcage and slip ring induction motors.
- Perform Direct and Indirect tests of various induction motors.
- Acquire hands on experience for conducting various tests on alternators and obtainingtheir performance indices using standard analytical as well as graphical methods.
- Develop experimental setups for studying the performance and operation of synchronous Motors.

Course Outcomes: After completion of this lab course, the student will be able to

CO1: Compare the performance characteristics of Induction motors.
CO2: Distinguish the performance of the given Induction motors.
CO3: Test the performance of synchronous generators.
CO4: Evaluate the performance of synchronous motors.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	3	-	-	-	-	3	2	-	2	3	2	2
CO2	3	3	2	3	-	-	-	-	3	2	-	2	3	2	2
CO3	3	3	2	3	-	-	-	-	3	2	-	2	3	2	2
CO4	3	3	2	3	-	-	-	-	3	2	-	2	3	2	2

List of Experiments:

1. Load test on Squirrel-Cage Induction motor.
2. Load test on Slip-Ring Induction motor.
3. No-load and Blocked rotor test on 3-phase induction motor.
4. Separation of losses of 3-phase Induction motor.
5. Brake test on single - phase induction motor.
6. Determination of Equivalent circuit of single - phase induction motor.
7. Real Power flow Control of 3-Phase Induction Generator.
8. Regulation of alternator by EMF &MMF method.
9. Regulation of alternator by ZPF method.
10. Synchronization of alternator with infinite bus with P & Q control.
11. Load test on Alternator.
12. Measurement of X_d and X_q of a three phase alternator.
13. V and inverted V curves of synchronous motor.
14. Synchronous Motor performance with constant excitation.
15. Load test on Universal Motor.

Note: Minimum 10 experiments should be conducted.

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MICROPROCESSOR & MICROCONTROLLER LAB

III B.Tech -V Semester (Code: 18EEL52)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

- Understand the working of TASM to write assembly language programs for 8086 microprocessors
- Understand the operation of 8086 development board
- Understand the operation of 8051 development board
- Understand the working of different programmable i/o devices

Course Outcomes: At the end of this course, students will showcase the ability to

CO1: Write basic programs in assembly language for 8086 microprocessors using TASM
CO2: Test complex programs in assembly language for 8086 microprocessors using TASM
CO3: Develop various applications by interfacing programmable i/o devices to 8086 development board
CO4: Develop various applications by interfacing programmable i/o devices to 8051 development board

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2	2	3	-	-	-	3	2	-	2	2	2	-
CO2	2	2	2	2	3	-	-	-	3	2	-	2	2	2	-
CO3	2	2	2	2	3	-	-	-	3	2	-	2	2	2	-
CO4	2	2	2	2	3	-	-	-	3	2	-	2	2	2	-

Program execution with Assembler

1. Programs on 16-bit arithmetic and logical operations for 8086 microprocessors. (using various addressing modes)
2. Programs on conditional and unconditional branching instructions for 8086 microprocessors
3. Programs to implement procedures for 8086 microprocessors.
4. Programs to sort given data using 8086 microprocessors.
5. Programs to implement string manipulations using 8086 microprocessors.
6. Programs to implement interrupt handling using 8086 microprocessors.

Program execution with 8086 Development boards

7. Study of Programmable peripheral interface 8255.
8. Study of Programmable interval timer 8254.
9. Study of Programmable Keyboard Display Interface 8279
10. Elevator Simulator interfacing with 8086 microprocessors.
11. Traffic light controller interfacing with 8086 microprocessors.
12. Stepper motor control using 8086 microprocessors.

Program execution with 8051 Development boards

13. Programming arithmetic, logical and bit manipulation instructions using 8051 microcontrollers.
14. Program and verify timer/counter in 8051 microcontrollers.
15. Program and verify interrupt handling in 8051 microcontrollers.
16. UART operation in 8051 microcontrollers.
17. Interfacing DAC and ADC to 805l microcontroller.
18. Interfacing stepper motor using 8051 microcontrollers.

Note: Minimum 10 experiments should be conducted

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SOFT SKILLS LAB

III B.Tech – V Semester (Code: 18ELL02)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives :

The course aims

- to make the engineering students aware of the importance, the role and the content of softskills through instruction, knowledge acquisition, demonstration and practice.
- to know the importance of interpersonal and intrapersonal skills in an employability setting
- actively participate in group discussions / interviews and prepare & deliver presentations
- function effectively in multi-disciplinary and heterogeneous teams through the knowledgeof team work, Inter-personal relationships, stress management and leadership quality

Course Outcomes: After completion of this lab course, the student will be able to

CO1: Use appropriate body language in social and professional contexts
CO2: Demonstrate different strategies in presenting themselves in professional contexts
CO3: Analyze and develop their own strategies of facing the interviews successfully
CO4: Develop team coordinating skills as well leadership qualities

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	3	3	2	2	-	-	2
CO2	-	-	-	-	-	-	-	2	3	3	2	2	-	-	2
CO3	-	-	-	-	-	-	-	2	3	3	2	2	-	-	2
CO4	-	-	-	-	-	-	-	2	3	3	2	2	-	-	2

UNIT-I

1. Body Language & Identity Management

a. Facial Expressions – Kinesics - Occulesics
b. Haptics - Proxemics
c. Para Linguistics
d. Appearance
e. Identity Management Communication

UNIT-II

2. Emotional Intelligence & Life Skills

a. Self Awareness through Johari Window and SWOC analysis
b. Self Motivation
c. Empathy
d. Assertiveness & Managing Stress
e. Positive Attitude
f. Time Management
g. Goal Setting: Short term, Long Term, Vision, Mission.

UNIT-III

3. Business Presentations

a. Preparing effective Presentations Power Point Presentations
b. Power Point Presentations
c. Using Visual Aids
d. Mock Presentations

UNIT-IV

4. Employability Skills

a. Group Discussion
b. Team Building and Leadership Qualities
c. Interview Skills

Reference Books:

- Personality Development and Soft skills (Second Edition), Barun K. Mithra. Oxford UniversityPress: 2016
- The Definitive Book of Body Language, Allan & Barbara. Pease International:2004
- Working with Emotional Intelligence, Daniel Goleman. Bloomsbury:1998
- English for Jobseekers, Lina Mukhopadhyay. Cambridge University Press:2013
- The 7 Habits of Highly Effective People, Stephen R. Covey. St. Martin's Press:2014

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AI TECHNIQUES IN ELECTRICAL ENGINEERING

III B.Tech VI-Semester (Code:18EE601)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students.

- Explain the concepts of artificial neural networks.
- Interpret the concepts of Fuzzy Logic.
- Grasp the concepts of Meta Heuristic techniques.
- Recognize the applications of AI techniques to Electrical Engineering

Course Outcomes : After completion of this course, students will be able to

CO1: Demonstrate the concepts of ANN Algorithms.
CO2: Describe the concepts of Fuzzy Logic.
CO3: Illustrate the concepts of Meta Heuristic techniques.
CO4: Apply soft computing (AI) techniques to real-world Electrical engineering problems.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	-	-	-	-	-	-	2	2	1	-
CO2	3	3	3	3	3	-	-	-	-	-	-	2	2	1	-
CO3	3	3	3	3	3	-	-	-	-	-	-	2	2	1	-
CO4	3	3	3	3	3	-	-	-	-	-	-	2	3	1	-

UNIT – I

Artificial Neural Networks: Introduction, Models of Neuron Network-Architectures – Knowledge representation, Artificial Intelligence and Neural networks–Learning process- Error correction learning, Hebbian learning–Competitive learning-Boltzman learning, supervised learning-Unsupervised learning–Reinforcement learning-Learning tasks.

ANN Paradigms: Multi-layer perceptron using Back propagation Algorithm (BPA), Self – Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network

UNIT – II

. **Fuzzy Logic:** Introduction –Fuzzy versus crisp, Fuzzy sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzy sets –Fuzzy cartesion Product, Operations on Fuzzy relations –Fuzzy logic –Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system, Defuzzification methods.

UNIT – III

Meta Heuristic techniques: Introduction Description of meta heuristics, Principle of population-

based meta heuristics Principle of population-based meta heuristics, Genetic algorithm, Differential evolution, Evolutionary programming, Backtracking search optimization algorithm, Particle swarm optimization, Ant colony optimization, Artificial bee colony, Firefly algorithm, Teaching–learning-based optimization

UNIT – IV

Applications of AI Techniques: ANN applications to Load forecasting and frequency control in Single area system, Fuzzy logic application to PSS and Speed control of DC and AC Motors, Meta Heuristic applications to Economic load dispatch.

TEXT BOOKS:

1. S.Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms", PHI, New Delhi, 2003.
2. Chaturvedi**,** Devendra K, "Soft Computing Techniques and its Applications in Electrical Engineering", Springer, 2008. J

REFERENCE BOOKS:

1. Hassoun, "Fundamentals of Artificial Neural Networks", MIT Press, 2010.
2. Kosko, "Neural Networks and Fuzzy Systems", Pearson Education, 2007.
3. Samir Roy, Udit Chakraborty, "Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms", Pearson Education India, 1st edition, 2013.

NPTEL COURSE LINKS:

1. NPTEL :: Computer Science and Engineering - NOC:Introduction to Soft Computing
2. NPTEL :: Electronics & Communication Engineering - Neural Networks and Applications
3. NPTEL :: Electrical Engineering - NOC:Fuzzy Sets, Logic and Systems & Applications
4. NPTEL :: Mechanical Engineering - NOC:Traditional and Non-Traditional Optimization Tools

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POWER SYSTEM PROTECTION
III B.Tech-VI Semester (Code: 18EE602)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Power systems, Basics of circuit theory.

Course Objectives: To make the students

- Develop adequate knowledge of requirement of protective relaying and about all types of protective relays.
- Provide the knowledge of static relays and Microprocessor based numerical relays.
- Explain Protection of alternators, transformers and transmission lines.
- Develop basic knowledge of switch gear and principles of operations of various types of circuit breakers

Course Outcomes: After completion of this course, students will be able to

CO1: Explain requirement of protective relaying and all types of relays.

CO2: Demonstrate basic components of static relays, types of comparators, types of over current relays and types of Microprocessors based numerical relays.

CO3: Describe differential and distance protection for generators, transformers and transmission lines and feeders.

CO4: Identify, differentiate and working of various types of circuit breakers.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	1	1	-	-	-	-	-	-	1	2	3	2
CO2	3	2	2	3	3	-	-	-	-	-	-	1	3	3	3
CO3	3	2	2	2	2	-	-	-	-	-	-	1	3	3	3
CO4	3	2	2	2	2	-	-	-	-	-	-	1	3	3	3

UNIT – I

Protective Relays: Introduction, basic requirement of protective relaying, zones of protection, primary and backup protection, classification of relays, attracted armature, balanced beam, induction disc, thermal relays, Buchholz's relay, Over current, under voltage, directional and non-directional relays. Distance relays, impedance, reactance, mho and off set mho relays. Differential relays, circulating current and opposite voltage differential scheme. Negative sequence relays.

UNIT – II

Static Relays and Microprocessor Relays: Introduction, basic component of static relays. Comparators-amplitude and phase comparators. Over current relays, instantaneous over current relay, inverse time over current relays, differential relays. Introduction to Microprocessor relays- Architecture of Microprocessor Relays- over current relays- distance and differential relays.

UNIT – III

Protection of Alternators, Transformers and Transmission Lines Stator and Rotor protection of alternators-Stator protection against inter turn faults-Rotor earth fault protection-Protection against loss of excitation- field suppression of alternator. Differential protection of transformers-Frame leakage protection- Differential protection of transmission line- Three stepped zone of distance protection of transmission line- - over current, distance and differential protection for feeders – carrier current protection – phase comparison – carrier aided distance protection.

UNIT – IV

Switchgear: Elementary principles of arc phenomenon, arc quenching, interruption of capacitive currents and low current chopping, resistance switching, recovery and restriking voltages. Principles of operations of various types of circuit breakers, air break, oil filled, air blast, vacuum and SF6 circuit breakers. Rating and specifications of circuit breaker.

TEXT BOOKS:

1. Badri Ram, D. N. Vishwakarma, "Power System Protection and Switchgear", Tata Mc-Graw Hill, 2nd Edition, 2-17.
2. U. A. Bakshi , Dr. M. V. Bakshi , "switchgear And Protection",Technical publications,2-21
3. Y.G. Paithankar & S.R.Bhide, "Fundamentals of Power System Protection", PHI, 2nd Edition, 2-13.
4. Bhuvanesh Oza, Nirmal-Kumar Nair, Rashesh Mehta and Vijay Makwana, "Power system protection & switchgear" Mc-Graw Hill, 1st Edition, 2-17.

REFERENCE BOOKS:

1. T.S. Madhava Rao, "Power system protection Static relays", Tata Mc-Graw Hill, 2nd Edition, 2-17
2. Sunil S Rao,"Switchgear Protection and Power Systems (Theory, Practice & Solved Problems)", Khanna Publishers, 14th Edition, 2-19.

3. Ravindranath B and M Chander, "Power system protection and switchgear" ,New Age International,2nd Edition, 2-18.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - Power System Protection
2. NPTEL :: Electrical Engineering - NOC:Power System Protection
3. https://nptel.ac.in/courses/1-81-7167

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ELECTRICAL DRIVES

III B.Tech-VI Semester (Code: 18EE603)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Electrical machines–I(18EE304), Electrical machines-II,(18EE403)&Power Electronics(18EE503).

Course Objectives: To make the students

- Describe the structure of Electric Drive systems and their role in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc., making Electric drives an enabling technology
- Describe the operation of dc motor drives to satisfy four-quadrant operation to meet Mechanical load requirements.
- Describe the operation of induction machines in an energy efficient manner using Power electronics.
- Learn the basic operation of stepper motors and switched-reluctance motor drives.

Course Outcomes: After completion of this course, the student will be able to

CO1: Classify different types of drives, Characteristics and applications in various industries &to know the characteristics of various motors and loads.
CO2: Describe about operation of dc motor speed control using converters and choppers.
CO3: Illustrate different speed control methods in induction motors using thyristors based Control schemes.
CO4: Demonstrate the basic operation of stepper motors and switched-reluctance motor drives.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	-	-	-	-	-	-	-	-	3	3	2	-
CO2	3	3	2	-	-	-	-	-	-	-	-	3	3	3	-
CO3	3	3	2	-	-	-	-	-	-	-	-	3	3	3	-
CO4	3	3	2	-	-	-	-	-	-	-	-	3	3	3	-

UNIT – I

Introduction: Electric drives - advantages of electric drive - Type of electric drives - components of electric drives - Status of dc and ac drives. **Dynamics of Electric Drives:** Speed torque conventions and multi quadrant operation - Equivalent values of drive parameters. **Control of Electric Drives:** Modes of operation - Speed control and drive classification - closed-loop control of drives.

UNIT – II

DC motor Drives: DC motors and their performance – Starting - methods of braking - speed control -Methods of armature voltage control - Transformer and uncontrolled rectifier control.

Controlled Rectifier fed DC Drives: Single phase fully and half controlled rectifier

control of separately excited dc motor - Three phase fully and half controlled rectifier control of separately excited dc motor - Dual converter control of separately excited dc motor - comparison of conventional.

Chopper fed DC Drives: Control of separately excited dc motors - Chopper control of series motor.

UNIT – III

Induction motor drives: Three phase induction motors - Operation with unbalanced source voltages and single phasing - Operation with unbalanced rotor impedances – Starting – braking - transient analysis - Speed control - pole amplitude modulation - stator voltage control - Variable frequency control from voltage and current sources - Eddy current drives - rotor resistance control - slip power recovery - Variable speed constant frequency generation.

UNIT – IV

Synchronous motor drives: Synchronous motors - Operation and fixed frequency supply - Synchronous variable speed drives - braking of synchronous motor. Switched reluctance motor drives - brush less dc motors - stepper motors – variable reluctance motor. Vector controls- Space vector modulation.

TextBooks:

1.G.K.Dubey,Fundamentals of Electric drives,Narosa,2ndEdition,2010.

ReferenceBooks:

1. G.K.Dubey, Power Semi conductor controlled drives, Prentice Hall India,2ndEdition2010.
2. S.B.Dewan,G.R.Selmon&Straughen,Power semi conductor drives, JohnWiley,2009.
3. G.K.Dubey, SRDoradla, Thyristorised power controllers, New Age International, 2nd edition,2012.

E-resourcesandotherdigitalmaterial

https://nptel.ac.in/courses/108108077

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APPLICATION OF IOT IN ELECTRICAL ENGINEERING

III B.Tech-V Semester (Code: 18EE604)

Lectures	3	Tutorial	0	Practical	3	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objective: The objective of this course is to impart necessary and practical knowledge of components of Internet of Things and develop skills required to build real-life IOT based projects. To make the students

- Explore the concepts of Internet of Things and its hardware and software components.
- Interface Sensor and Actuators with Arduino/Raspberry Pi.
- Construct the Basic Networking with ESP8266 WiFi module.
- Analyze basic IOT applications using Cloud Platforms.

Course Outcomes: After the completion of this course, the students will be able to

CO1: Explain internet of things and its hardware and software components.

CO2: Acquire knowledge on interface I/O devices, sensors and communication modules.

CO3: Design and monitor the sensor data remotely.

CO4: Develop real time IOT based projects.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	-	-	-	3	2	-	-	3	2	-	3	3	-	-
CO2	2	3	3	3	3	2	-	-	3	2	-	3	3	2	2
CO3	2	3	3	3	3	3	-	-	3	3	-	3	3	2	2
CO4	2	3	3	3	3	3	-	-	3	3	-	3	3	2	2

UNIT I

Introduction to IOT, Arduino and Raspberry Pi Simulation Environment: Understanding IoT fundamentals, IOT Architecture and protocols, Difference between IOT & M2M, Various Platforms for IOT, Real time Examples of IOT, Overview of IoT components and IOT Communication Technologies, Challenges in IOT. Arduino and Raspberry Pi Architecture, hardware setup and software installation for Arduino and Raspberry Pi, Basics of Embedded C programming for Arduino, Interfacing LED and push button with Arduino and Raspberry Pi

UNIT II

Sensor and Actuators with Arduino/ Raspberry Pi: Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino/Raspberry Pi, Interfacing of Actuators with Arduino/Raspberry Pi, Interfacing of Relay Switch and Servo Motor with Arduino/Raspberry Pi.

UNIT III

Basic Networking with ESP8266 WiFi module: Basics of Wireless Networking, Introduction to ESP8266 Wi-Fi Module, Various Wi-Fi library, Web server-introduction, installation, configuration, Posting sensor(s) data to web server.

UNIT IV

Cloud Platforms for IOT: Virtualization concepts and Cloud Architecture, Cloud computing, benefits, Cloud services -- SaaS, PaaS, IaaS, Cloud providers & offerings, Study of IOT Cloud platforms, Thing Speak API and MQTT, Interfacing ESP8266 with Web services

TEXT BOOK:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, Internet of Things: Technologies and Applications for a New Age of Intelligence, Academic Press, 2nd Edition, 2018.
2. Raj Kamal, Internet of Things: Architecture and Design , McGraw Hill Education; 1st Edition, 2017.

REFERENCE BOOKS:

1. Jeeva Jose, Internet of Things, Khanna Publishing, 1st edition, 2018.
2. Vijay Madisetti and Arshdeep Bahga, Internet of Things (A Hands-on- approach), Orient Blackswan Private Limited , 1st Edition, 2015.
3. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: key applications and Protocols, Wiley, 1st Edition, 2015.
4. Michael Miller,The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities are Changing the World , Que Publishing, 1st Edition, 2015.

Swayam Portal link:

https://onlinecourses.nptel.ac.in/noc19_cs65/preview

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POWER SYSTEM OPERATION CONTROL AND STABLITY

III B.Tech-VI Semester (Code: 18EE605)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Mathematics, Power system-1, Power System-2

Course Objectives: To make the students

- Understand economic load dispatch under various operational constraints and techniques to solve the problem.
- Modeling of turbines and generators and know the importance of quality of power, P-f, Q-V control loops, AGC
- To deal with the numerical methods studied in applied mathematics courses to get the Solutions of load flow problem and comparison of different methods.
- Discuss the concept of reactive power and voltage control in detail.
- Understand Power system stability and voltage stability in operation of power system.

Course Outcomes: After the completion of this course, the students will be able to

CO1: Explain the importance of economic operation of power systems

CO2: Develop the mathematical models of turbines and governors and know the importance of single area and AGC

CO3: Develop proper mathematical models for analysis of load flow study

CO4: Explain the importance and control of reactive power and voltage

CO5: Explain the stability issues concerned with power system operation

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	-	-	-	-	3	-	-	2	3	2	2
CO2	3	3	2	2	-	-	-	-	-	-	-	2	-	3	-
CO3	3	-	3	-	-	-	-	-	-	-	2	2	-	2	-
CO4	3	2	3	-	-	-	-	-	-	-	-	2	3	-	-
CO5	3	-	3	3	-	-	-	-	-	-	-	2	-	3	-

UNIT – I

Economic operation of power systems: Economic dispatch in thermal power station: Heat rate curves, cost curves, incremental fuel and Production costs, economic distribution of load between units without consideration to line losses; Transmission line losses as a function of plant generation, calculation of loss coefficients, Optimum generation allocation between thermal plants; Capability diagram of a synchronous generator.

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UNIT – II

Quality of power: Importance of keeping voltage and frequency constant in a power system **The two main control loops- (P-δ) and (Q – V) loops:** Load frequency control (LFC) single area case, the P- **δ** loop: Schematic of load frequency and AVR of a synchronous generator, mathematical modelling of generator, loads, prime mover and speed governor for LFC & corresponding block diagram representation, LFC block diagram of an isolated power system, steady state analysis, dynamic response. The automatic generation control (AGC) scheme – AGC in a single area system, block diagram representation of AGC for an isolated power system

UNIT – III

Formulation of Load Flow Problem: Introduction – nonlinear equations - Power Flow Solution Algorithms, solution techniques using Gauss Seidel, Newton Raphson Load Flow Methods.

Reactive power control: The role of excitation system- exciter, generator and sensor models, simplified AVR block diagram,

Voltage control of distribution systems: Tap changing, booster transformers, synchronous phase modifiers, induction regulators and static capacitors.

Transmission line compensation: Series compensation, shunt compensation, static VAR Compensators – thyristor-controlled reactors (TCR), thyristor switched capacitors (TSC), and STATCOM.

UNIT – IV

Power system stability: Introduction – steady state stability, Transient stability, Review of machine swing equation - Equal area criterion of stability – applications. Step by step solution of the swing curve – factors affecting steady state and transient stabilities.

Voltage stability: Introduction, comparison of angle & voltage stability, reactive power flow and voltage collapse, Mathematical formulation of voltage stability problem.

TEXT BOOKS:

1. Power system analysis by H.Saadat , McGraw Hill -2nd Edition 2004
2. Modern power system analysis by D.P.Kothari & I.J.Nagrath McGraw Hill-4th Edition, 2011.
3. Power System Analysis operation and control by Abhijit Chakrabarti & Sunita Halder, PHI Learning Pvt. Ltd, 3rd Edition 2010

REFERENCE BOOKS:

1. Economic Operation of Power System - L. K. Kirchmeyer, Wiley India Pvt Ltd 2009.
2. Power System Analysis by T.K.Nagsarkar M.S.Sukhija, OXFORD university press, 2nd edition 2014.
3. Generation Distribution and utilization of Electrical Energy by CL Wadhwa, New Age Int. Pub, Revised 2/E 3rd Edition 2015.
4. Electrical Energy Systems by John Weedy, Willey Eastern, 5th Edition 2012.
5. Power System Stability and Control by Prabha Kundur, McGraw Hill Education; 1st edition 2006.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - Power Systems Operation and Control
2. NPTEL :: Electrical Engineering - Power Systems Operation and Control
3. NPTEL :: Electrical Engineering - Power Systems Analysis

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OPTIMIZATION TECHNIQUES

III B.Tech – VI Semester (Code: 18EED11)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

- Explain the Concepts to solve linear programming problems arise in real life situations involving several parameters using various methods and their advantages.
- Discuss the applications of linear programming namely transportation, assignment and travelling salesman problem which arise i n different situations in all engineering branches.
- Explain the non-linearity in optimization problems, direct search techniques and iterative methods.
- Discuss the applications of optimization techniques in the problem Dynamic programming in optimization and solve certain integer linear programming problems.

Course Outcomes: After completion of this course, students will be able to

CO1: Develop the mathematical model of an optimization problem and solve a given linear programming problem using suitable method.

CO2: Obtain solution for a special type linear programming problem namely transportation, assignment & travelling salesman problem.

CO3: Describe the characteristics of non-linearity in optimization and solve certain NLPP using searching and iterative techniques.

CO4: Describe the characteristics of Dynamic programming in optimization and solve certain integer linear programming problems.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	3	-	2	-	-	-	3	2	2	2	1
CO2	3	3	3	2	2	-	2	-	-	-	3	2	2	2	1
CO3	3	3	3	2	3	-	2	-	-	-	3	2	2	2	1
CO4	3	3	3	2	3	-	2	-	-	-	3	2	2	2	1

UNIT-I

Linear Programming Problems (LPP): Mathematical models and basic concepts of linear programming problem; Solution of linear programming problems - Graphical method, Analytical method, Simplex method, Artificial variable technique (Big-M and Two-phase methods), Duality principle and dual simplex method.

UNIT-II

Special type of LPPs: Mathematical model of transportation problem, Methods of finding initial basic feasible solution to find the optimal solution of transportation problem, Exceptional cases in transportation problem, Degenerate solution of transportation problem, Assignment problem as a special case of transportation problem, Hungarian algorithm to

solve an assignment problem, Special cases in assignment problem. The salesman problem, Formulation of travelling salesman problem as an assignment problem.

UNIT-III

Non-linear Programming Problems (NLPP): Classical method of optimization using Hessian matrix, Iterative methods - Random search methods, Steepest decent method and Conjugate gradient method; Direct methods - Lagrange 's method, Kuhn-Tucker conditions, Penalty function approach.

UNIT – IV

Dynamic Programming:

Principle of optimality – recursive relations – solution of LPP – simple examples.

Integer Linear Programming: Gomory's cutting plane method – Branch and bound algorithm – Knapsack problem – linear -–1 problem.

TEXT BOOKS:

1. Kantiswarp,P.K.Gupta, Man Mohan, ―Operations Research‖, S. Chand & Sons, New Delhi. 16/e., 2013. (Unit I,II)
2. S.S. Rao, ―Optimization Techniques‖, New Age International, New Delhi, 3/e., 2013.

REFERENCE BOOKS:

1. Hamdy. A. Taha, Operations Research, Prentice Hall of India Ltd, New Delhi, 7/e., 2002.
2. J.C. Pant, ―Introduction to Optimization‖, Jain Brothers, New Delhi, 7/e., 2012.
3. K.V.Mittal : Optimization Methods, Wiley Eastern Ltd. 2005

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ELECTRICAL ENERGY CONSERVATION & AUDITING

III-B.Tech VI-Semester (Code: 18EED12)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course objectives: To make the students

- Understand the concept of energy conservation, energy management.
- Know the energy efficient motors and its characteristics.
- Understand the power factor improvement, lighting and different measuring instruments.
- Know the economic aspects of energy management.

Course outcomes: At the end of this course, students will be able to

CO1: Examine the principles of Energy audit and its process in thermal power station and analyze the different aspects of energy management. Describe the characteristics of energy efficient motors.

CO2: Illustrate the power factor improvement, good lighting system practice and the types of energy instruments

CO3: Demonstrate the economic aspects of Energy Management.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	1	-	3	2	-	1	3	-	1	1
CO2	3	-	1	-	-	2	1	1	1	-	3	-	-	1	2
CO3	3	-	3	-	-	2	3	1	1	-	-	3	-	2	1
CO4	3	-	1	-	-	1	1	2	3	-	1	3		-	1

UNIT-I

Basic Principles of Energy Audit: Energy audit - definitions, concept , types of audit, energy index, cost index , pie charts, Sankey diagrams, load profiles, Energy conservation schemes - Energy saving potential, energy audit of thermal power station, building energy audit.

Energy Management: Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting, Energy manger, Qualities and functions, language, Questionnaire - check list for top management.

UNIT-II

Energy Efficient Motors: Energy efficient motors, factors affecting efficiency, loss distribution, constructional details. Characteristics - Variable speed, variable duty cycle systems, Voltage variation -Voltage unbalance - Over motoring - Motor energy audit.

UNIT-III

Power Factor Improvement, Lighting & Energy Instruments: Power Factor Improvement, Lighting: Power factor – Methods of improvement, location of capacitors, Pf with nonlinear loads,

effect of harmonics on power factor. Power factor motor controllers - good lighting system design and practice, lighting control, lighting energy audit. Energy Instruments: Watt meter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application of PLC's.

UNIT-IV

Economic Aspects and Analysis: Economics Analysis - Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis - Energy efficient motors, Calculation of simple payback method, net present worth method - Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

TEXT BOOKS:

1. W.R. Murphy and G. Mckay, "Energy Management", Butter worth Publications.
2. John. C. Andreas, "Energy Efficient Electric Motors", Marcel Dekker Inc Ltd, 2nd Edition, 1995.

REFERENCES:

1. Paul O' Callaghan, "Energy Management", Mc-Graw Hill Book Company, 1st Edition, 1998.
2. W.C.Turner, "Energy Management Hand Book", A John Wiley and Sons.
3. S. C. Tripathy, "Utilization of Electrical Energy", Tata McGraw Hill, 1993.
4. Guide books for National Certification Examination for Energy Manager / EnergyAuditors Book-1, General Aspects (available online).
5. L.C. Witte, P.S. Schmidt and D.R.Brown, "Industrial Energy Management and Utilization", Hemisphere Publication, Washington, 1998

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POWER DISTRIBUTION SYSTEM
III B.Tech-VI Semester (Code: 18EED13)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

- Describe the distribution system planning models and study different load characteristics.
- Illustrate the different types of distribution transformers and sub-transmission systems.
- Learn about the primary distribution system, secondary distribution systems and about protection devices.
- Determine voltage drop and power loss for non-three phase primary lines.

Course Outcomes: At the end of this course, students will be able to

CO1: Explain the various factors affecting the distribution system and also about distribution system planning.
CO2: Illustrate the Distribution Transformers, voltage regulation, Efficie0ncy calculations and design considerations of sub-transmission lines.
CO3: Classify the substation, feeders, primary and secondary distribution systems, also the protective devices.
CO4: Determine the voltage drop, line loss calculation and the effect of compensation on power factor improvement.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1	1	-	-	-	-	-	-	-	-	2	3	2	2
CO2	3	2	1	-	-	-	-	-	-	-	-	2	3	2	2
CO3	3	2	2	-	-	-	-	-	-	-	-	2	3	2	2
CO4	3	2	2	-	-	-	-	-	-	-	-	2	3	2	2

UNIT – I

Distribution system planning and automation: Planning and forecast techniques - Present and future role of computers in distribution system planning –automation - Methods of improvement - Load characteristics – Definitions load growth – tariffs - Diversified demand method.

UNIT – II

Distribution transformers: Types - Regulation and Efficiency- distribution factors – KW KVA Method of determining regulation. Design of sub transmission lines and distribution substations: Introduction – sub transmission systems - distribution substation – Substation bus schemes - description and comparison of switching schemes – substation location and rating - Application of network flow techniques in rural distribution networks to determine optimum location of sub-station.

UNIT – III

Design considerations on primary systems: Introduction, types of feeders, - voltage levels Radial type feeders, feeders with uniformly distributed load and non-uniformly distributed loads. Design considerations of secondary systems: Introduction, secondary voltage levels, - Secondary banking, existing systems improvement. Distribution system Protection: Basic definitions, over current protection devices, fuses, automatic circuit reclosures, automatic line sectionalizers, objectives of distribution system protection, coordination of protective devices, Fuse to Fuse co-ordination, Fuse to circuit breaker coordination, Reclosure to circuit breaker co-ordination.

UNIT-IV

Voltage drop and power loss calculations: Three phase primary lines, non 3 phase primary lines, 4 wire multi grounded primary lines, copper loss, Distribution feeder costs, loss reduction and voltage improvement in rural distribution networks. Applications of Capacitors to distribution systems: Effect of series and shunt capacitors, Power factor correction, economic justification for capacitors, a computerized method to determine the economic power factor, Procedure to determine the best and optimum capacitor location Distribution System Voltage Regulation: Basic definitions, Quality of service, voltage control, line drop compensation.

TEXT BOOKS:

1. Turan Gonen, Electric Power Distribution System Engineering, CRC Press, 3rd Edition, 2014.
2. Dr. V. Kamaraju, Electrical distribution systems McGraw hill, 2017.

REFERENCE BOOK:

1. A.S. Pabla, Electric Power Distribution TMH, 7th Edition. 2019.
2. G. Ramamurthy, Hand Book of Electric Power Distribution, 2nd Edition, Universitie Press,2009.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Electrical distribution system analysis, https://archive.nptel.ac.in/courses/108/107/108107112/

2.NPTEL :: Electrical Engineering - NOC:operation and planning of power distributionSystems, https://onlinecourses.nptel.ac.in/noc22_ee35/preview

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DIGITAL SIGNAL PROCESSING

III B.Tech – VI Semester (Code: 18EED14)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Signals and Systems

Course Objectives: To make the students

- Acquire knowledge in LTI signals and systems and the concept of Z-transform.
- Demonstrate DFT and IDFT using different algorithms.
- Model Digital IIR filters from Analog filters using various techniques.
- Model Digital FIR filters using various window techniques.

Course Outcomes: After the completion of this course, students will be able to

CO1: Demonstrate the LTI signals and systems and concept of Z-transform.

CO2: Illustrate DFT and IDFT using DIT-FFT and DIF-FFT algorithms.

CO3: Construct the Butter worth and Chebyshev digital IIR filters and their realization.

CO4: Implement the appropriate type of design method for FIR filters and their realization.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	-	-	-	-	2	-	2	3	2	2
CO2	3	3	3	3	3	-	-	-	-	2	-	2	3	2	2
CO3	3	3	3	3	3	-	-	-	-	2	-	2	3	2	2
CO4	3	3	3	3	3	-	-	-	-	2	-	2	3	2	2

UNIT – I

Discrete Signals and Systems: Introduction to digital signal processing, advantages and applications, discrete time signals, LTI system, stability and causality. Frequency domain representation of discrete time signals and systems.

Z-Transforms: Introduction to Z-transform, Z-transform theorems and properties, Inverse Z transform, causality and stability, solution of difference equations. MATLAB programming to generate discrete time sequence, plot the frequency response of system and to find partial fraction of H(Z).

UNIT – II

Discrete Fourier Transform (DFT): Introduction, Properties of DFT, Linear convolution using DFT, computations for evaluating DFT and IDFT.

Fast Fourier Transform (FFT): Introduction, advantages of FFT, Decimation in time FFT algorithms - Decimation in frequency FFT algorithm, IDFT using FFT algorithm. MATLAB programming to compute the DFT of sequence x(n) and comparison of circular and linear convolution of two sequences.

UNIT – III

IIR Filter Design Techniques: Introduction, Properties of IIR filters, Design of analog proto type of digital filters, Digital Butterworth and Chebyshev filters using bilinear transformation, Impulse invariance transformation methods.

Realization of IIR Filters: Direct form, Canonic form, Cascade form, Parallel form and

Lattice- Ladder form of realizations. MATLAB programming on design of Butterworth and Chebyshev filters

UNIT – IV

FIR Filter Design Techniques: Introduction to characteristics of linear phase FIR filters, Frequency response. Comparison of IIR and FIR filters. Designing of FIR filters using windowing techniques.

Realization of FIR Filters: Transversal structure, cascade realization, Linear phase

realization, Lattice structure.

MATLAB programming to design digital FIR filters using windowing method.

TEXT BOOK:

1. John G. Proakis, Dimitris G Manolakis, digital Signal Processing: Principles, Algorithms and Applications, Pearson Nw International Education, 4th Edition, 2014.
2. P. Ramesh Babu, Digital Signal Processing, SciTech Publications (India) Pvt Ltd, 6th Edition, 2015.

REFERENCE BOOKS:

1. Lonnie C Ludeman, Fundamentals of Digital Signal Processing, Wiley India Pvt. Ltd., ISBN-10⁀: ⁀8126522224, 2012.
2. S K Mitra, Digital Signal Processing: A Computer Based Approach, McGraw Hill Education 4th Edition, 2013.
3. Johnny R. Johnson, Introduction to Digital Signal Processing, Pearson Education India, 1st Edition, 2015.
4. Alan V Oppenheim and Ronald W Schafer, Discrete Tme Signal Processing, Pearson Education India, 3rd Edition, 2014.

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NPTEL COURSE LINKS:

1. Digital Signal Processing and its Applications - Course (nptel.ac.in)
2. Digital Signal Processing - Course (nptel.ac.in)
3. NPTEL :: Electrical Engineering - Digital Signal Processing

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CONTROL SYSTEM LAB

III B.Tech –VI Semester (Code: 18EEL61)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Mathematics, Network Theory

Course Objectives: To make the students

- Able to analyze characteristics of various types of systems.
- To familiarize with the modelling of dynamical systems.
- Able to design Lag, Lead, Lead-Lag compensators theoretically & experimentally.
- To familiarize to observe the effect of P, PI, PD and PID controllers on system.
- Able to find the closed loop stability of the system with different approaches.

Course Outcomes: After the completion of this course, students will be able to

CO1: Draw characteristics of various types of systems.

CO2: Observe and plot the responses of first and second order systems

CO3: Design and verify Lag, Lead, Lead-Lag compensators experimentally.

CO4: Illustrate the effect of P, PI, PD and PID controllers on a control system.

CO5: Measure and interpret stability of the system through Frequency Response Method.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	2	-	-	-	-	3	2	-	2	2	3	-
CO2	3	3	2	2	-	-	-	-	3	2	-	2	2	3	-
CO3	2	2	3	2	-	-	-	-	3	2	-	2	2	3	-
CO4	3	3	-	2	-	-	-	-	3	2	-	2	2	3	-
CO5	3	3	-	2	-	-	-	-	3	2	-	2	2	3	-

LIST OF EXPERIMENTS:

1. Characteristics of magnetic amplifier.
2. Characteristics of A.C servo motor
3. Characteristics of synchros.
4. Effect of feedback on D.C servomotor.
5. Transfer function of D.C motor
6. Transfer function of D.C generator.
7. Time response of second order systems
8. Simulation of transfer functions using operational amplifier
9. Stepper motor control.

10. D.C. position control System.
11. Lag and lead compensation – Magnitude and phase plot
12. Temperature controller using PID
13. Effect of P, PD, PID controller on a second order system
14. P, PI, PD, PID control using Op-Amps.
15. Frequency response of first and second order systems.

Note: Minimum 10 experiments should be conducted.

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POWER ELECTRONICS LAB

III B.Tech – VI Semester (Code: 18EEL62)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Semiconductor Physics and Nano Materials (20EE202/PH03).

Course Objectives: To make the students

- Conduct the Turning ON and OFF of Transistor and Power Electronics Devices.
- Illustrate AC to DC Conversion circuits on R, RL, Back emf Loads.
- Categorize the operation of inverters PWM techniques on R, Motor Loads.
- Outline the operation of DC-DC choppers and AC Voltage controllers on R Load.

Course Outcomes: After the completion of this course, students will be able to

CO1: Test the basic operation and compare performance of various power semiconductor devices, passive components and switching circuits.

CO2: Justify the performance of AC to DC Conversion circuits with different loads.

CO3: Measure the operation of inverters and PWM techniques.

CO4: Assess the operation of DC-DC choppers and AC Voltage controllers.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	3	-	-	-	-	3	2	-	2	3	2	2
CO2	3	3	2	3	-	-	-	-	3	2	-	2	3	3	3
CO3	3	3	3	3	3	-	-	-	3	2	-	2	3	3	3
CO4	3	3	3	3	1	-	-	-	3	2	-	2	3	3	3

LIST OF EXPERIMENTS:

A- Essential Experiments

1. Static characteristics of SCR, TRIAC.
2. Characteristics of MOSFET & IGBT.
3. Gate triggering methods for SCR (R, RC, UJT).
4. 1- phase Half & Full controlled rectifier with R, RL & RLE load.
5. Voltage commutated DC chopper with R load.
6. 1-phase modified series inverter with R load.
7. 1-phase parallel inverter with R & RL loads.

B- List of Optional Experiments:

(i) Chose one Experiment

8. 1-phase Cyclo-converter (Center tapped or Bridge) with R load.

9. 1- phase IGBT based inverter with R, RL loads.
10. 1-phase Dual converter with R, RL & RLE loads (Circulating and Non-circulating modes).

(ii) Chose one Experiment

11. 3-phase Half & Full controlled Rectifier with R, RL and RLE loads.
12. 3-phase IGBT based inverter with R, RL loads.
13. Buck Boost Converter with R load.

(iii) Chose one Experiment

14. DSP based speed control of BLDC motor.
15. DSP based speed control of 3-phae Induction motor.
16. Study of 1-phase full wave Mc-Murray Bedford Inverter with R, RLE load.

Note: Minimum 10 experiments should be conducted.

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SIMULATION LAB

III B.Tech-VI Semester (18EEL63)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

- Analyze various power electronic circuits and AGC using MATLAB/P-SIM
- Determine the bus impedance and admittance matrices using MATLAB.
- Apply numerical methods for solving load flow problems and verify using MATLAB/MI-POWER
- Analyze various faults occurring in power system and simulate the faults using MIPOWER/MATLAB

Course Outcomes: After the completion of this course, students will be able to

CO1: Simulate and analyse various power electronic circuits and AGC using MATLAB/P-SIM
CO2: Derive a Mathematical model for impedance and admittance matrices.
CO3: Execute numerical methods for solving load flow problems and verify using MATLAB/PSIM.
CO4: Design and verify various faults occurring in power system and simulate the faults using MIPOWER

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	2	2	-	-	-	3	2	-	3	2	3	-
CO2	3	2	2	3	-	-	-	-	3	2	-	3	2	3	2
CO3	3	2	2	2	2	-	-	-	3	2	-	3	2	3	-
CO4	2	2	3	2	2	-	-	-	3	2	-	3	2	3	2

LIST OF EXPERIMENTS:

MATLAB/PSIM:

1. Simulation of Boost and Buck converters.
2. Simulation of Three phase three level PWM converter.
3. Simulation of single area load frequency control with and without PI controller and without PI controller.
4. Study of Economic load dispatch.
5. Formation of Y_{BUS} and Z_{BUS}.

LABVIEW:

1. Simple Amplitude Measurement
2. Building Arrays Using For Loop and While Loop
3. Generation of Random Signal

4. Waveform Minimum & Maximum Value Display
5. Matrix Fundamentals

MIPOWER/ETAP.

1. Study of Gauss Seidel load flow analysis.
2. Study of Newton Raphson method of load flow analysis.
3. Study of Fast decoupled
4. Study of symmetrical/ unsymmetrical fault analysis in a power system.
5. Study of Transient stability.

Note: Minimum 10 experiments should be conducted.

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HIGH VOLTAGE ENGINEERING

IV B.Tech – VII Semester (Code: 18EE701)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Pre-requisites: Physics, Circuit theory, Power systems 1

Course objectives: To make the students.

- Understand the breakdown phenomenon in solids, liquids and gases.
- Know the concepts of partial discharges.
- Identify the generation of high voltages.
- Employ different measuring techniques in high voltages.
- Know the protective techniques against over voltages.
- Interpret different testing techniques of different high voltage apparatus.
- Aware of the layout of high voltage laboratories.

Course Outcomes: At the end of the course, the student will be able to

CO1: Demonstrate the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials.

CO2: Examine the generation and measurement of D. C., A.C., & Impulse voltages.

CO3: Illustrate the standards needed to conduct tests on H. V. equipment and on insulating materials, as per the standards.

CO4: Apply the knowledge of protection against over voltages and illustrate the layout of HV labs

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	1	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	1	2	-	-	-	-	-	-	-	-	3	3	-
CO3	2	1	2	2	-	-	-	-	-	-	-	-	3	3	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-	3	-	-

UNIT-I

Breakdown phenomenon of Gases, Liquids and Solids: Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge. Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

UNIT-II

Generation of High voltages: Generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT-III

Measurement of high voltages and currents: Measurements of Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements. Protection against over-voltages, Surge diverters, Surge modifiers.

UNIT-IV

High voltage testing techniques: Various standards for HV Testing of electrical apparatus, IS, IEC standards, testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

TEXTBOOKS:

1. High Voltage Engineering by M.S.Naidu and V.Kamaraju – TMH.
2. C. L. Wadhwa, "High Voltage Engineering", New Age International Publishers,2007.

REFERENCE BOOKS:

1. High Voltage Engineering fundamentals by Kuffel and Zungel, Elsavier Publications
2. D. V. Razevig (Translated by Dr. M. P. Chourasia), "High Voltage Engineering Fundamentals", Khanna Publishers, 1993.
3. R. Arora and W. Mosch "High Voltage and Electrical Insulation Engineering", John Wiley & Sons, 2011.

NPTEL COURSE LINK:

1. **NPTEL :: Electrical Engineering - High Voltage Engineering**

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ELECTRICAL MACHINE DESIGN
IV B.Tech-VII Semester (Code: 18EED21)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

- Develop knowledge on principles of design of rotating machines
- Design main dimensions & cooling systems of transformers
- Gain knowledge on main dimensions of induction motor and its classification
- Learn about design of salient pole and cylindrical rotor Alternators.

Course Outcomes: After the completion of this course, the students will be able to

CO1: Compute the various parameters of a dc machine and provide the information required for the fabrication of the same along with an estimate of various performance indices.

CO2: Demonstrate about all transformer details with mathematical expressions and provide the information required for the fabrication of the same.

CO3: Calculate and estimate the performance of an Induction motor in the design of stator and rotor.

CO4: Illustrate about design of stator and rotor of synchronous machines and study their behavior.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	-	1	3	-	2
CO2	3	3	3	-	-	-	-	-	-	-	-	1	3	-	2
CO3	3	3	3	-	-	-	-	-	-	-	-	1	3	-	2
CO4	3	3	3	-	3	-	-	-	-	-	-	1	3	-	2

UNIT-I

D.C. MACHINES: E.M.F generated from full pitch - fractional pitch with and without distributed windings - distribution factor. Design of main dimensions from output equation - Design of Armature windings - Design of field system - Design of inters pole and commentator.

UNIT-II

TRANSFORMERS: Derivation of output equation - volt per turn importance and calculation of main dimensions for three phase and single phase transformers - window dimensions - Yoke design and coil design - Design of tank with tubes. Basic design aspects of dry transformer and high frequency transformers.

UNIT-III

INDUCTION MOTOR: Derivation of output equation - calculation of main dimensions – Stator design - number of slots - shape and area of slots - Rotor design for squirrel cage and slip ring types.

UNIT-IV

SYNCHRONOUS MACHINES: Derivation of output equation - Calculations of Main Dimensions for salient pole and cylindrical rotor alternators - Stator design - number of stator slots and slot dimensions - Pole design for salient pole generators - pole winding calculations. Design of rotor for cylindrical rotor alternator - Design of rotor windings.

COMPUTER AIDED DESIGN: Advantage of computer aided design - Flow chart for computer aided design.

TEXT BOOKS:

1. A.K. Sawhney, Dhanpatrai & Sons, "A Course in Electrical Machine Design", 2016.
2. M.G. Say, PB, "Performance and Design of AC Machines", CBS Publishers, ISBN-13- 978-812391-277, 2002.

REFERENCE BOOKS:

1. V S Nagarajan, V Rajini, Electrical Machine Design, Pearson Publications, 1st edition, 2018.
2. V.N.Mittle, Arvind Mittal, Design of Electrical Machines, Standard Publishers Distributors, ISBN-13-978-818-141263, 2009.
3. A.E. Clayton, N.N Hancock, Performance and Design of AC Machines, CBS Publishers ISBN-13-978-81239-9271, 2004.
4. M. Ramamurthy, E. Horwood, Computer aided design of electrical equipment, BS Publications, 2008.

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CONTROL SYSTEMS DESIGN

IV B.Tech – Semester-VII (Code: 18EED22)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Mathematics, Physics

Course Objectives: To make the students

- To train students to understand the Time and frequency domain responses in terms of specifications.
- To teach students to Design controllers in the time domain.
- To teach students to Design controllers in the frequency domain
- To guide students to assess controllability and observability of control systems
- To teach students to Analysis of Nonlinear Systems.

Course Outcomes: After the completion of this course, the students will be able to

CO1: Explain various design specifications.
CO2: Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).
CO3: Design simple feedback controllers.
CO4: Design controllers using the state-space approach.
CO5: Assess effect of various nonlinearities

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	2	-	-	-	-	1	-	-	2	3	2	2
CO2	3	2	3	2	-	-	-	-	1	-	-	2	3	3	2
CO3	3	2	3	2	-	-	-	-	1	-	-	2	3	3	2
CO4	3	2	3	2	-	-	-	-	1	-	-	2	3	3	2
CO5	3	2	3	2	-	-	-	-	1	-	-	2	3	2	2

UNIT – I

Introduction: Introduction to design problem and philosophy. Introduction to time domain and frequency domain design specification and its physical relevance.

Response of System: Effect of gain on transient and steady state response. Effect of addition of pole on system performance. Effect of addition of zero on system response

UNIT – II

Design of Classical Control System in the time domain: Introduction to compensator. Design of Lag, lead lag-lead compensator in time domain. Feedback and Feed forward compensator design. Feedback compensation. Realization of compensators.

UNIT - III

Design of Classical Control System in frequency domain: Compensator design in frequency domain to improve steady state and transient response. Feedback and Feed forward compensator design using bode diagram. Design of P, PI, PD and PID controllers in time domain and frequency domain for first, second and third order systems. Control loop with auxiliary feedback – Feed forward control.

UNIT – IV

Control System Design in state space: Review of state space representation. Concept of controllability & observability, effect of pole zero cancellation on the controllability & observability of the system, pole placement design through state feedback. Ackerman's Formula for feedback gain design. Design of Observer. Reduced order observer. Separation Principle.

Nonlinearities and its effect on system performance: Various types of non-linearity's. Effect of various non-linearity's on system performance. Singular points. Phase plot analysis.

TEXT BOOKS:

1. K. Ogata, Discrete-Time Control systems, Pearson Education/PHI, 2nd Edition, 1995.
2. V. I. George, C. P. Kurian, Digital Control Systems, Cengage Learning, 2012.
3. M. Gopal, Digital Control Engineering, New Age Int. Pvt. Ltd., 2014.

REFERENCE BOOKS:

1. Kuo, Digital Control Systems, Oxford University Press, 2nd Edition, 2003.
2. M. Gopal, Digital Control and State Variable Methods, 2nd Edition, TMH, 2006.
3. M. Sami Fadali Antonio Visioli, Digital Control Engineering Analysis and Design, Academic Press, 2013.

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SWITCHED MODE POWER SUPPLY

IV B.Tech – VII Semester (Code: 18EED23)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Power Electronics (20EE504).
Course Objectives: To make the students

- Classify of various Switched Mode Power Supply components
- Outline the Modelling and control aspects of converter.
- illustrate various Soft-switching DC - DC Converters
- Assess the Nonlinear phenomena of Pulse Width Modulated Rectifiers

Course Outcomes: At the end of this course, the students will be able to

CO1: Illustrate various reactive elements in Power Electronic Systems.

CO2: Classify different controllers for converter.

CO3: Illustrate various modes of operation of DC-DC converters.

CO4: Assess the Pulse Width Modulated Rectifiers.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	-	-	-	-	-	-	-	2	3	3	2
CO2	3	3	3	2	-	-	-	-	-	-	-	2	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	2	3	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	2	3	3	3

UNIT-I

Design constraints of reactive elements in Power Electronic Systems: Design of inductor, transformer and capacitors for power electronic applications, Input filter design. Basic concepts and steady-state analysis of second and higher order Switched Mode power converters.

UNIT – II

Dynamic Modelling and control of second and higher order switched Mode power converters: Analysis of converter transfer functions, Design of feedback compensators, current programmed, frequency programmed and critical conduction mode control.

UNIT – III

Soft-switching DC - DC Converters: Zero-Voltage-switching converters, Zero-Current switching converters, Multi resonant converters and load resonant converters.

UNIT – IV

Pulse Width Modulated Rectifiers: Properties of ideal rectifier, realization of near ideal rectifier, control of the current waveform, single phase and three-phase converter systems incorporating ideal rectifiers and design examples. Nonlinear phenomena in switched mode power converters: Bifurcation and Chaos.

TEXT BOOKS:

1. H.W.Whittington, B. W. Flynn and D. E. MacPherson, Switched Mode Power Supplies Design and Construction, Universities Press (India) Pvt. Ltd., 2nd Edition, 2009.
2. Mohan N. Undeland . T & Robbins W, Power Electronics Converters, Application and Design, John Wiley, 3rd Edition, 2007.

REFERENCE BOOKS:

1. Krein P.T, Elements of Power Electronics, Oxford University Press, 2nd Edition, 2014.
2. M. H. Rashid, Pearson, Power electronics: circuits, devices, and applications, Pearson India Education Services Pvt.Ltd, 4th Edition, 2017.
3. Umanand L, Bhat S.R, Design of magnetic components for switched Mode Power Converters, New Age International (P) Ltd, 1st Edition, 2009.
4. R.W.Erickson, Fundamentals of Power Electronics, Springer; 1st Edition, 2013.

Web Source Links:

1. L.Umanand, “Fundamental of Power Electronics” NPTEL Course ; https://onlinecourses.nptel.ac.in/noc22_ee03/preview.
2. Dr. Robert Erickson,” Power Electronics Specialization”, COURSERA, https://www.coursera.org/specializations/power-electronics.

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DIGITAL PROTECTION OF POWER SYSTEMS

IV B.Tech VII-Semester (Code:18EED24)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Power system protection, Power System

Course Objectives: To make the students

- Explain the advantages of digital relays over conventional relays.
- Apply the suitable signal processing technique for protection.
- Demonstrate the adaptive criterion for relay decision making.
- Identify the new developments in protective relaying and applications.

Course Outcomes: After completion of this course students will be able to

CO1: Demonstrate the advantages of digital relays over conventional relays.

CO2: Apply the suitable signal processing techniques for protection.

CO3: Illustrate the adaptive criterion for relay decision making.

CO4: Demonstrate the new developments in protective relaying and applications.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	2	-	-	-	-	-	-	2	3	2	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2	3	2	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2	3	2	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2	3	2	2

UNIT – I

Static and Digital Relays: Overview of Static relays, Transmission line protection, Transformer protection, Need for digital protection., Basic elements of a digital relay and their functions, signal conditioning subsystem, conversion subsystem, digital relay subsystem.

UNIT –II

Signal processing techniques: Sinusoidal based algorithms, Fourier Analysis based algorithms, Least squares-based algorithm, Discrete Fourier Transforms, Wavelet Transforms, Kalman Filtering.

Digital filters: Fundamentals of Infinite Impulse Response Filters, Finite Impulse Response filters, Filters with sine and cosine windows. Travelling Wave Protection scheme, Digital Protection of Transformers.

UNIT-III

Decision making in Protective Relays: Deterministic decision making, Statistical Hypothesis testing, Decision making with multiple criterion, Adaptive decision schemes, Adaptive Differential protective scheme.

UNIT-IV

Applications: Applications of Fuzzy Logic and ANN for power system protection, Fault location algorithm, Wide Area Monitoring and Protection.

TEXT BOOKS:

1. Bhide S. R., Digital Power System Protection, PHI Learning Private Limited, ISBN-10¶ :⁋8120349792, 2014.
2. Arun G. Phadke, James S. Thorp, Computer Relaying for power Systems, Wiley India Pvt Ltd, 2nd Edition, 2012.

REFERENCE BOOKS:

1. Badri Ram, D. N. Vishwakarma, Power System Protection and Switchgear, Tata Mc-Graw Hill, 2nd Edition, 2017.
2. T.S. Madhava Rao, Power system protection Static relays, Tata Mc-Graw Hill, 2nd Edition, 2017.
3. Waldemar Rebizant, Janusz Szafran and Andrzej Wiszniewski, Digital Signal Processing in Power System Protection and Control, Springer, 11th Edition, 2013.

NPTEL LINKS:

1. NPTEL: Digital Protection of Power System, IIT Roorkee, Prof. Bhaveshkumar R. Bhalja, https://nptel.ac.in/courses/117107148
2. NPTEL :: Electrical Engineering - NOC:Power System Protection
3. NPTEL: Power System Protection, https://archive.nptel.ac.in/courses/108/101/108101039

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HVDC & FACTS

IV B.Tech–VII Semester (Code:18EED31)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Pre requisites: Power Electronics, Transmission & Distribution system

Course Objectives: To make the students

- Study comparison of AC and DC Transmission systems and components of HVDC.
- Discuss the control aspects of HVDC System and harmonics introduction.
- Explain the fundamentals of FACTS Controllers and basic types of FACTS Controllers.
- Study objectives of shunt, series and combined compensators and their control Structure

Course Outcomes: After completion of the course the student will be able to

CO1: Compare HVAC and HVDC system and to describe various types of DC links in HVDC converter and inverter operation.

CO2: Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems.

CO3: Explain concept of FACTS controller for the specific application based on system requirements and types of facts controllers.

CO4: Illustrate the objectives of Shunt Controllers, Series controllers &combined controllers for various functions such as Transient stability Enhancement, voltage instability prevention and power oscillation damping.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	1	1	1	-	-	-	-	-	-	1	3	2	2
CO2	3	3	3	2	2	-	-	-	-	-	-	1	3	2	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2	3	2	2
CO4	3	2	3	2	2	-	-	-	-	-	-	2	3	2	2

UNIT–I

HVDC transmission: HVDC Transmission system: Introduction, comparison of AC and DC systems, applications of DC transmission, types of DC links, Layout of HVDC Converter station and components of HVDC system. Line commutated converter and voltage source converter-based systems.

UNIT–II

Control of HVDC system: Principles of control, desired features of control, converter control characteristics, power reversal, Ignition angle control, current and extinction angle control. Harmonics introduction, generation, ac filters and dc filters. Introduction to multi terminal DC systems and applications, comparison of series and parallel MTDC systems.

UNIT–III

FACTS concepts: Reactive power control in electrical power transmission, principles of conventional reactive power compensators. Introduction to FACTS, flow of power in AC parallel paths and meshed systems, basic types of FACTS controllers, definitions of FACTS controllers, brief description of FACTS controllers.

UNIT–IV

Static Shunt, Series and Combined Compensators: Shunt compensation–objectives of shunt compensation, static VAR compensators–SVC, STATCOM, SVC and STATCOM comparison. Series compensation–objectives of series compensation, thyristor switched series capacitors (TCSC), static series synchronous compensator (SSSC), power angle characteristics. Unified power flow controller (UPFC)–Introduction, operating principle, independent real and reactive power flow controller and control structure. Inter line power flow controller (IPFC)– Introduction, operating principle.

TEXT BOOKS:

1. NarainG.Hingorani ,LaszloGyugyi,Understanding Facts: Concepts and Technology of Flexible AC Transmission Systems, Wiley India Pvt Ltd (2011).
2. KR Padiyar, “Hvdc Power Transmission Systems New Age Publishers; Third edition (2017)

REFERENCES:

1 . K.R. Padiyar , Facts Controllers In Power Transmission And Distribution, New Age International Pvt Ltd; Second edition (2016).
2 S Kamakshaiah , V Kamaraju , HVDC Transmission | by McGraw Hill; Second edition (2020)

NPTEL LINKS:

1.HTTPS://NPTEL.AC.IN/COURSES/1-81-7114
2.HTTPS://NPTEL.AC.IN/COURSES/1-81-4-13
3. HTTPS://ARCHIVE.NPTEL.AC.IN/COURSES/1-8/1-7/1-81-7114/
4. HTTPS://NPTEL.AC.IN/COURSES/1-81-616-

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ELECTRICAL AND HYBRID VEHICLES

IV B.Tech – VII Semester (Code: 18EED32)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Power Conversion Techniques, Electrical Machines

Course objectives: To make the students

- Understand the concept of Vehicle Fundamentals.
- Know the Operation of Electric and Hybrid drive-train topologies.
- Understand the configuration and control of different motor drives.
- Know the Operation of different types of energy storage systems.

Course outcomes: At the end of this course, students will be able to

CO1: Explain the concepts of Vehicle Fundamentals

CO2: Describe the operation of Electric and Hybrid drive-train topologies.

CO3: Analyze configuration and control of different motor drives.

CO4: Analyze operation of different types of energy storage and management systems.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	2	-	-	-	-	-	-	-	1	2	-	-
CO2	2	2	3	3	-	-	-	-	-	-	-	2	3	3	2
CO3	2	2	3	3	-	-	-	-	-	-	-	2	2	2	3
CO4	2	2	3	2	-	-	-	-	-	-	-	2	2	-	

UNIT-I

Introduction and Vehicle Fundamentals: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

UNIT-II

Electric and Hybrid drive-trains: Basic concept of electric traction - introduction to various electric drive-train topologies - power flow control in electric drive-train topologies - fuel efficiency analysis. Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT-III

Electric propulsion unit: Introduction to electric components used in electric vehicles - configuration and control of DC Motor drives - Configuration and control of Induction Motor drives- Configuration and control of Permanent Magnet Motor drives - Configuration and control of Switch Reluctance Motor drives - Drive system efficiency.

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UNIT-IV

Energy storage and Management: Introduction to Energy Storage Requirements in Electric Vehicles - Battery based energy storage and its analysis - Fuel Cell based energy storage and its analysis - Super Capacitor based energy storage and its analysis -Hybridization of different energy storage devices. Introduction to energy management strategies used in hybrid and electric vehicle, classification of different energy management strategies, comparison of different energy management strategies

TEXT BOOKS:

1. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,Second Edition 2005.
2. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
3. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2014.

REFERENCES:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, Second Edition 2003.
2. H. Partab: Modern Electric Traction – Dhanpat Rai& Co, 2007.
3. Bimal Bose, 'Power electronics and motor drives', Elsevier, First Edition 2006.
4. Ion Boldea and S.A Nasar, 'Electric drives', CRC Press, Second Edition 2005.

NPTEL VIDEO LINK:

https://nptel.ac.in/courses/108/103/108103009/

https://nptel.ac.in/courses/108/106/108106182/

https://nptel.ac.in/courses/108/102/108102121/

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LINE COMMUTATED AND ACTIVE RECTIFIERS
IV B.Tech – VII Semester (Code: 18EED33)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Semiconductor Physics and Nano Materials (18PH003), Power Electronics (18EE503).

Course Objectives: To make the students

- Discuss the controlled rectifier with passive filters.
- Explain operation of PWM approach and harmonic elimination.
- Outline the operation of Single-phase ac-dc single-switch and bidirectional boost converter.
- Study the operation of Isolated single-phase ac-dc fly back converter.

Course outcomes: At the end of this course, students will be able to

CO1: Demonstrate the basic operation of controlled rectifier with passive filters.

CO2: Categories the performance of PWM based inverters with harmonic elimination.

CO3: Outline the operation of Single-phase ac-dc single-switch and bidirectional boost converter.

CO4: Illustrate the operation of Isolated single-phase ac-dc fly back converter.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	-	-	-	-	-	-	-	2	3	2	3
CO2	3	3	3	2	-	-	-	-	-	-	-	3	3	3	3
CO3	3	3	3	2	-	-	-	-	-	-	-	3	3	3	3
CO4	3	3	3	2	-	-	-	-	-	-	-	2	3	3	3

UNIT-I

Thyristor rectifiers with passive filtering: Half wave, Full wave Rectifiers with RL and RLE loads; 1-phase full-wave rectifiers with L, C and LC filter; 3-phase rectifiers with L, C and LC filter; Relationship between I/P and O/P voltages- expression for filter inductor and capacitors; input current waveshape, commutation overlap.

UNIT-II

Multi-Pulse converter: PWM techniques: single- multiple- and sinusoidal PWM techniques- selective harmonic elimination- space vector modulation; Review of transformer phase shifting,

generation of 6-phase ac voltage from 3-phase ac, 6-pulse converter and 12-pulse converters with inductive loads, steady state analysis, commutation overlap, notches during commutation.

UNIT-III

Single-phase ac-dc single-switch and bidirectional boost converter: Review of dc-dc boost converter, power circuit of single-switch ac-dc converter, steady state analysis, unity power factor operation, closed-loop control structure. Review of 1-phase inverter and 3-phase inverter, power circuits of 1-phase and 3-phase ac-dc boost converter, steady state analysis, operation at leading, lagging and unity power factors. Rectification and regenerating modes. Phasor diagrams, closed-loop control structure.

UNIT-IV

Isolated single-phase ac-dc flyback converter: DC-DC flyback converter, output voltage as a function of duty ratio and transformer turns ratio. Power circuit of ac-dc flyback converter, steady state analysis, unity power factor operation, closed loop control structure.

TEXT BOOKS:

1. John G. Kassakian, David J. Perreault , George C. Verghese , Martin F. Schlecht, Principles of Power Electronics, Pearson Education India, 1st Edition, 2010.
2. G. De, Principles of Thyristorised Converters, Oxford & IBH Publishing Co, 1st Edition, 1988.

REFERENCE BOOKS:

1. R.W.Erickson, Fundamentals of Power Electronics, Springer; 1st Edition, 2013.
2. L. Umanand, Power Electronics: Essentials and Applications, Wiley India, 1st Edition, 2009.
3. N. Mohan and T. M. Undeland, Power Electronics: Converters, Applications and Design, John Wiley & Sons, 3rd Edition, 2007.

NPTEL COURSE LINKS:

1. https://www.youtube.com/watch?v=VA0gkl1C7qw&list=PLp6ek2hDcoNAZzkG0zfABMmFNtGUl9QMB
2. https://www.youtube.com/watch?v=pXvinzrCPVc

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COMPUTER AIDED POWER SYSTEMS

IV B.Tech VII-Semester (Code:18EED34)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Mathematics-I, Power System-II

Course Objectives: To make the students

- To form incidence matrices and to prepare primitive impedance and admittance matrices with and without mutual coupling.
- To deal with the numerical methods studied in applied mathematics courses to get the solutions of load flow and comparison of different methods.
- To teach the methods of mathematical formulation of complex power system and short circuit calculations.
- To analyze the Contingency situations in the power system network
- To understand the Transient Stability analysis of power system

Course Outcomes: After completion of this course, Students will be able to

CO1: Demonstrate the formation of incidence matrices and to prepare primitive impedance and admittance matrices with and without mutual coupling.

CO2: Build and solve proper mathematical models for the load flow analysis.

CO3: Identify the significance to conduct short circuit analysis of power system network for selection of protective devices.

CO4: Model the contingency analysis of the existing system for the purpose of security.

CO5: Solve transient stability problems in power system.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	1	-	-	-	-	-	-	-	3	3	2	3
CO2	3	3	3	1	-	-	-	-	-	-	-	3	3	2	3
CO3	3	3	3	1	-	-	-	-	-	-	-	3	3	2	3
CO4	3	3	3	1	-	-	-	-	-	-	-	3	3	2	3
CO5	3	3	3	1	-	-	-	-	-	-	-	3	3	2	3

UNIT – I

Incidence & Network Matrices: Introduction to Graph Theory, Element-node incidence matrix - reduced incidence matrix or bus incidence matrix - basic loop incidence matrix - augmented loop incidence matrix - basic cut set incidence matrix - augmented cut set incidence matrix - branch path incidence matrix - concept of primitive network - primitive impedance and admittance matrices with and without mutual coupling - network performance equations - formation of network matrices using singular & non-singular transformation.

UNIT – II

Formulation of Load Flow Problem: Introduction – nonlinear equations - Power Flow Solution

Algorithms solution techniques using Gauss iterative, Gauss Seidel Power Flow Equations, Newton Raphson Load Flow Method, Fast Decoupled Load Flow Method and DC Load Flow Methods. AC-DC System Power Flow Analysis- Sequential and Simultaneous Solution Algorithms.

UNIT – III

Algorithm for formation of network matrices: Formation of bus admittance and bus impedance matrices and respective algorithms - modifications of bus impedance and admittance matrices for changes in the networks with and without mutual coupling. Representation of three phase network elements for balanced and unbalanced systems.

Short Circuit studies: Short circuit calculations for symmetrical and unsymmetrical faults using Bus Impedance matrix.

UNIT – IV

Security Analysis: Basic Concepts, Static Security Analysis at Control Centers, Contingency Analysis, Importance of contingency analysis, Contingency Selection**.**

Formulation of Transient Stability Problem: Transient Stability Analysis of Multi-Machine Systems, Eigen Analysis of Dynamical Systems, Small Signal Stability Analysis using Classical Model. Flow chart for digital simulation of transient stability problem. Infinite bus using swing equation for the machine and incorporating excitation (IEEE, 1981) turbine and speed governor controls.

TEXT BOOKS:

1. Stagg, G.W. & El-Abiad, Computer methods in Power System Analysis, Medtech scientific international, ISBN-10‍ : ‍9388716159, 2019
2. L.P. Singh, Advanced Power System Analysis and Dynamics, New Age International Private Limited, 6th edition, 2012.

REFERENCE BOOKS:

1. Anderson &Fouad, Power Systems Control and stability, Wiley-IEEE **Press,** 3rd edition 2019.
2. Nagrath&Kothari, Modern power system analysis 4th edition, TMH 2011.
3. M.A. Pai, Computer Techniques in Power System Analysis, TMH 2017.
4. P. Kundur, Power System Stability & Control, 1st edition TMH 2006.

NPTEL LINKS:

1. NPTEL :: Electrical Engineering - NOC:Computer Aided Power System Analysis
2. NPTELComputer Aided Power System Analysis

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INDUSTRIAL MANAGEMENT & ENTREPRENEUR SHIP

IV B.Tech-VII Semester (Code: 18ME002)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives:

- To provide students an insight into the concepts of industrial management and various forms of business organizations
- It aims to provide the students with an understanding of basics of production systems, productivity and quality.
- To enable the students to understand the inventory control concept.
- To make the students to learn various financial aspects of the business
- To know the depreciation and its methods of measuring depreciation.
- To Provide an understanding of personnel management.
- Students are exposed to know the importance of Entrepreneurship
- To impart the knowledge of marketing to the students

Course Outcomes: After completion of the course the student must be able to

CO1: Describe the roles & the responsibilities and various functions of the management. Learn various forms of business organizations and its dynamics

CO2: Understand concepts of productivity and know the ways of enhancing productivity. Develop knowledge about inventory control.

CO3: Learn how depreciation occurs and various methods of calculating depreciation. Understand various motivation theories and leadership styles.

CO4: Grasp complete knowledge of importance of entrepreneurship and its prerequisites.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	-	1	-	-	-	-	1		1	1	2
CO2	-	-	-		2	-	3	-	-	-	-	-	-	-	-
CO3	1	1	-	-	-	-	-	2	-	1	2	-	3	-	2
CO4	-		-	3	-	-	-	-	1	-		-	1	-	-

UNIT – I

General Management: Management definition, Functions of Management and Principles of Management.

Scientific Management: Definition, Principles of Scientific Management.

Forms of Business Organization: Choice of form of organization, Salient features of Sole Proprietorship, Partnership, Joint Stock Company: Private Limited and Public Limited companies; Cooperative societies, public sector organizations, State ownership, public corporation, Merits and demerits of above types.

Introduction to Strategic Management: Definition and scope

UNIT – II

Human Resource Management: Functions of HR management, human resource planning, recruitment, selection, placement, training & development and performance appraisal, Motivation theories, leadership styles.

Marketing Management: Concepts of Selling and Marketing, Functions of Marketing, Marketing mix (4 Ps); Advertising and sales promotion; Product life cycle; distribution channels

UNIT – III

Materials Management: Inventory Control, Inventory costs, Basic EOQ model, Model with Price breaks, ABC analysis, FSN Analysis, VED Analysis.

Total Quality Management: Importance of quality, Difference between Inspection and Quality control, Components of total quality, Quality Function Deployment

Introduction to Supply Chain Management: Definition, scope of SCM, Drivers of SCM, Advantages, limitations

UNIT – IV

Financial Management: Functions of finance, Types of Capital-Fixed and Working Capital, Break Even Analysis.

Entrepreneurship Development: Introduction, Entrepreneurial characteristics, Functions of an Entrepreneur; Factors affecting entrepreneurship; Role of communication in entrepreneurship; Entrepreneurial Development-Objectives, Need of Training for enterprises; Finance for the enterprises.

TEXT BOOKS:

1. Essentials of Management /Koontz and Heinz Weihrich/ Tata-McGraw-Hill 10th Ed.
2. Manufacturing Organization and Management / Amrine / Pearson Education
3. Management Science, A. R. Aryasri.
4. Industrial Engineering and production management by M Mahajan, Dhanapat rai Publications
5. Marketing Management, Philip Kotler.

REFERENCE BOOKS:

1. Entrepreneurship, Robert D Hisrich, Michael P Peters, Mathew Manimala and Dean A. Shepherd-McGraw Hill, India-2014 (9th Edition)–ISBN: 9789339205386

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CONSTITUTION OF INDIA

IV B.Tech-VII Semester (Code: 18EEE706/18HU001)

Lectures	3	Tutorial	0	Practical	0	Credits	0
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

- Study the importance of constitution
- Discuss philosophy of fundamental rights and dutiesDescribe the central and state relation, financial and administrative.
- Explain the autonomous nature of constitutional bodies like Supreme Court and high
- court, controller and auditor general of India and election commission of India.

Course Outcomes: After completion of this course, Students will be able to

CO1: Explain the Fundamental rights.

CO2: Describe the Fundamental duties and its importance.

CO3: Explain about the uses of Panchayath Raj system in India and its duties.

CO4: Demonstrate the System of Election Commission and its functions.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	2	2	1	-	-	-	1	-	-	-
CO2	-	-	-	-	-	2	2	1	-	-	-	1	-	-	-
CO3	-	-	-	-	-	2	2	1	-	-	-	1	-	-	-
CO4	-	-	-	-	-	2	2	1	-	-	-	1	-	-	-

UNIT-I

1. Meaning of the constitutional law and constitutionalism.
2. Historical perceptive of the constitution of India
3. Salient features and characteristics of the constitution of India.
4. Preamble, union and its territory and citizenship.

UNIT – II

5. Fundamental rights principles.
6. Directive principles of state policy.
7. Fundamental Duties.
8. The government of the union, the president, The Prime Minister, and the council of ministers, The parliament of India, The supreme court, the union judiciary

UNIT – III

9. The Machinery of Government in the states, The Governor, The Chief Minister and council of Ministers, The State legislature, High court, Judiciary in the states
10. Union territories.
11. The Federal System, Division of powers between centre and states, Legislative Administration and financial relation.
12. Emergency Provisions, President Rule, National Emergency, Financial Emerging
13. Local self-Government, Panchayat Raj, Municipalities and municipal Corporation.

UNIT IV

13. Local self-Government, Panchayat Raj, Municipalities and municipal Corporation
14. Miscellaneous Provisions, The comptroller and Auditor general of India, The Public Service Commission, Special Provisions relating to certain classes, Elections – Political parties.
15. Amendment of the Constitution.

REFERENCE BOOKS:

1. Constitutional Government in India - M V Pylee – Asia Publishing House
2. Indian Government and Politics – D C Dasgupta. Vikas Publishing house
3. The Oxford Hand Book of the Indian Constitution, Sujit Chowdary, Madhav Khosla Pratapabhem Mehla.
4. Constitutional question in India ; The President , Parliament and the States – Noorani A G – Oxford.
5. Indian Constitution and its features – Astoush Kumar, Anmol Publishers
6. The Constitution of India – Bakshi P M – Universal Law Publishers
7. Legelect's the constitution of India – Ramnarain Yadav, K K Legelest Publication

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PROJECT STAGE-I

IV B.Tech-VII Semester (Code: 18EEP01)

Lectures	0	Tutorial	0	Practical	6	Credits	2
Continuous Internal Evaluation			50	Semester End Examination (3 hours)			50

Course Objectives: To make the students

- Understand a problem in the chosen area of interest and analyze
- Explain information on latest developments in the selected areas, software development.
- Build a prototype solution to industrial/ theoretical problems and publish paper.
- Accomplish a common goal by effective on teams work.

Course Outcomes: After the completion of this course, the students will be able to

CO1: Select a problem in the chosen area of interest and analyze.
CO2: Demonstrate information on latest developments in the selected areas, software development.
CO3: Develop a prototype solution to industrial/ theoretical problems and publish paper.
CO4: Realize a common goal by effective on teams work.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	2	-	-	-	3	2	-	2	3	3	2
CO2	3	3	2	2	-	-	-	-	3	2	-	2	3	3	2
CO3	3	3	2	2	-	-	-	-	3	2	-	2	3	3	2
CO4	3	3	2	-	2	-	-	-	3	2	-	2	3	3	2

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POWER SYSTEMS LAB

IV B.Tech-VII Semester (Code: 18EEL72)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Evaluation			50	semester End Examination (3 hours)			50

Prerequisites: **Mathematics, PDS, RES.**

Course Objectives: To make the students

- Analyze the performance of transmission line
- Able to do Experiment in various protection of generator, feeder and transmission line using relays and circuit breakers
- Able to conduct testing about the various electromagnetic relays
- Be competent in use of static and digital relays.
- Develop simulation model for RES

Course Outcomes: After the completion of this course, the students will be able to

CO1: Analyze the performance of transmission line
CO2: Examine various protection of generator, feeder and transmission line using relays and circuit breakers
CO3: Execute testing about the various electromagnetic relay
CO4: Competent in use of static and digital relays.
CO5: Analyze simulation model for RES

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	2	1	-	-	-	3	2	-	2	2	3	-
CO2	3	2	2	3	-	-	-	-	3	2	-	2	2	3	-
CO3	3	2	2	2	2	-	-	-	3	2	2	2	2	3	2
CO4	2	2	3	2	2	-	-	-	3	2	-	2	2	3	-
CO5	3	3	-	2	2	-	-	-	3	2	-	2	2	3	3

LIST OF EXPERIMENTS:

1. Determination of ABCD parameters/regulation and efficiency of transmission line model.

2. Characteristics of IDMT over current relay/ over voltage electromagnetic relay.

3. Finding the sequence impedances of 3-phase synchronous machine.

4. Reactive power compensation using tap changing transformer.

5. Surge impedance loading of transmission line model.

6. Find cable fault using cable fault locator/Find hotspots using thermal image camera.

7. To study characteristics of MCB & HRC Fuse.

8. Test to find out polarity, ratio and magnetization characteristics of CT and PT.

9. Study on (i) on load Time Delay Relay (ii) off load Time Delay Relay.

10. Characteristics of over current/earth fault using numerical relay.

11. Characteristics of numerical distance relay.

12. Characteristics of numerical differential relay.

13. Identifying and Measuring the parameters of solar PV module in the field.

14. Series and parallel connection of PV Modules

15. Study of Solar / wind turbine generator power plant.

Note: Minimum 10 experiments should be conducted.

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ELECTRONICS DESIGN LAB
IV B.Tech-VII Semester (Code: 18EEL73)

Lectures	2	Tutorial	0	Practical	3	Credits	2
Continuous Internal Evaluation			50	semester End Examination (3 hours)			50

Prerequisites: Basic Knowledge of C-programming, Basic of Electronics.

Course Objectives: To make the students

- Simulate a voltage regulator with short circuit protection and multiple output voltage levels for a power supply.
- Implement and simulate a reconfigurable pulse generator, time delay circuit, and power converter driver circuit.
- Create a PCB layout for a mobile charger, dual output adjustable linear power supply and light strobe.
- Develop a PCB layout to facilitate the retrofitting of conventional appliances control and design an automated water pumping system.
- Generate PCB layouts a mobile charger, dual output power supply, appliance control retrofitting and an automated water pumping system.

Course Outcomes: After completion of this course students will be able to

CO1: Implementation and simulation of voltage regulator with short circuit protection and multiple output voltage levels for a power supply.
CO2: Build and simulate a reconfigurable pulse generator, time delay circuit, and power converter driver circuit.
CO3: Develop a PCB layout for a mobile charger, dual output adjustable linear power supply and a light strobe.
CO4: Create a PCB layout to facilitate the retrofitting of conventional appliances control and design an automated water pumping system.
CO5: Design PCB layouts a mobile charger, dual output power supply, appliance control retrofitting and an automated water pumping system.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	2	-	-	-	-	-	-	2	3	2	2
CO2	3	3	3	3	2	-	-	-	-	-	-	2	3	2	2
CO3	3	3	3	3	2	-	-	-	-	-	-	2	3	2	2
CO4	3	3	3	3	2	-	-	-	-	-	-	2	3	2	2
CO5	3	3	3	3	3	-	-	-	-	-	-	2	3	2	2

LIST OF EXPERIMENTS:

1. Design and simulate a voltage regulator
2. Design and simulate a short circuit protection circuit
3. Design and simulate a power supply with multiple output voltage levels

4. Design and simulate a reconfigurable pulse generator
5. Design and simulate a time delay circuit
6. Design and simulate a power converter driver circuit
7. Design a PCB layout for mobile charger
8. Fabrication of PCB layout for mobile charger
9. Design a PCB layout for dual output adjustable linear power supply
1-. Fabrication of PCB layout for dual output adjustable linear power supply
11. Design a PCB layout for light strobe
12. Fabrication of PCB layout for light strobe
13. Design a PCB layout to simplify a conventional appliance control through retrofitting
14. Fabrication of PCB layout to simplify a conventional appliance control through retrofitting
15. Design a PCB sketches for automated water pumping system
16. Fabrication of PCB layout for automated water pumping system.

Note: Minimum 10 experiments should be conducted.

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INTERNSHIP
IV B.Tech-VII Semester (Code: 18EEL74)

Lectures	0	Tutorial	0	Practical	0	Credits	2
Continuous Internal Evaluation			100	Semester End Examination (3 hours)			0

Course Objectives: To make the students

- Equip students with a comprehensive understanding of key environmental regulations and standards relevant to electrical engineering projects.
- Develop students' ability to tackle complex engineering problems by considering environmental impacts and sustainability.
- Foster innovation by integrating environmental sustainability into the design and development of electrical engineering projects.
- Promote teamwork and collaboration across different disciplines to address environmental and engineering challenges.

Course Outcomes: After completion of this course **s**tudents will be able to

CO1: Identify and apply appropriate environmental laws and guidelines in their engineering designs and projects.
CO2: Demonstrate improved problem-solving skills by incorporating environmental considerations into their engineering solutions.
CO3: Create project designs that are both innovative and aligned with current industry trends in sustainability.
CO4: Effectively work in interdisciplinary teams, gaining exposure to diverse perspectives and enhancing their collaborative skills.

Mapping of Course Outcome with Program Outcomes and Program Specific Outcomes

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	2	-	2	2	3	3	-	3	3	2	2
CO2	3	3	2	2	2	-	2	2	3	3	-	3	3	2	2
CO3	3	3	2	2	2	-	2	2	3	3	-	3	3	2	2
CO4	3	3	2	2	2	-	2	2	3	3	-	3	3	2	2

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POWER QUALITY

IV B.Tech – VIII Semester (Code: 18EED41)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Evaluation			50	semester End Examination (3 hours)			50

Prerequisites: Generation and Transmission, Power Electronics

Course Objectives: To make the students

- Classify the power quality problems.
- Categorize voltage sag and voltage swell problems and suggest preventive techniques.
- Identify the harmonic sources and the effects of harmonic distortion.
- Distinguish the Power Quality Conditioners.

Course Outcomes: After completion of this course students will be able to

CO1: Summarize different types of power quality problems with their source of generation.

CO2: Examine different methodologies for detection, classification and mitigation of power quality problems.

CO3: Illustrate the active & passive filters for harmonic elimination.

CO4: Demonstrate the Power Quality Conditioners.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	2	-	-	1	-	-	-	-	2	3	2	2
CO2	3	3	3	2	-	-	1	-	-	-	-	2	3	2	2
CO3	3	3	3	2	-	-	1	-	-	-	-	2	3	2	2
CO4	3	3	3	2	-	-	1	-	-	-	-	2	3	2	2

UNIT – I

INTRODUCTION: Electric power quality phenomena - IEC and IEEE definitions - power quality disturbances - voltage fluctuations-transients-unbalance-waveform distortion-power frequency variations. Voltage variations - Voltage sags and short interruptions – flicker - longer duration variations.

UNIT – II

VOLTAGE SAGS AND INTERRUPTIONS: Sources of sagas and interruptions, Estimating voltage sag performance, fundamental principles of protection, solutions at the

end-use level, Motor-starting sags, utility system fault-clearing Issues.

TRANSIENT OVER VOLTAGES: Sources of over voltages, principles of over voltage protection, devices for over voltage Protection, utility capacitor-switching transients, utility system lightning protection.

UNIT – III

FUNDAMENTALS OF HARMONICS: Harmonics – sources – definitions & standards – impacts - calculation and simulation –harmonic power flow - mitigation and control techniques – filtering – passive and active

UNIT – IV

POWER QUALITY CONDITIONERS: Power Quality conditioners – shunt and series compensators – D-Statcom - Dynamic voltage restorer - unified power quality conditioners - case studies

TEXT BOOKS:

1. Roger C. Dugan, Mark F.McGranaghan, Surya Santoso, H.Wayne Beaty, Electrical Power Systems Quality, TMH Education Pvt. 3rd Edition, Ptd.2017

2. C. Sankaran, Power quality CRC Press, 1st Edition, 2019

REFERENCE BOOKS:

1. J. Arrillaga, N.R. Watson,S. Chen, Electrical systems quality Assessment, John Wiley & Sons. ISBN-13 97808126531745, Reprint 2018.
2. Math H. J. Bollen Understanding Power quality problems ,IEEE Press. ISBN-13 97808126530397, Reprint 2016.
3. Bhim Singh, Ambrish Chandra and Kamal Al-Haddad Power Quality: Problems and Mitigation Techniques, John Wiley & Sons Ltd., U.K,ISBN-13 97801118922057, 2015.

NPTEL Links

1. **https://nptel.ac.in/courses/1-8/1-2/1-81-2179/**
2. **https://nptel.ac.in/courses/1-8/1-7/1-81-7157/**

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SMART GRID TECHNOLOGY AND APPLICATIONS

IV B.Tech VIII-Semester (18EED42)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Evaluation			50	semester End Examination (3 hours)			50

Prerequisites: Generation and Transmission, Power System Analysis

Course objectives: To make the students

- Explain the Basic concept of Smart Grid.
- Discuss the Information & Communications Technology for The Smart Grid.
- Acquire Knowledge about Smart Metering and Advanced Metering infrastructure.
- Describe he operation of Demand Side Integration and Distribution Management Systems.

Course outcomes: At the end of this course, students will be able to

CO1: Explain Basic concept of Smart Grid.

CO2: Describe Suitable Communication Network and Security System for Smart Grid.

CO3: Demonstrate Operation of Smart Metering and Advanced Metering infrastructure.

CO4: Summarize Operation of Demand Side Integration and Distribution Management Systems

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	3	2	-	-	1	-	-	-	-	2	3	2	2
CO2	2	3	3	2	-	-	1	-	-	-	-	2	3	2	2
CO3	2	3	3	2	-	-	1	-	-	-	-	2	3	2	2
CO4	2	3	3	2	-	-	1	-	-	-	-	2	3	2	2

UNIT-I

Introduction to Smart Grid: Introduction, Ageing Assets and Lack of Circuit Capacity, Thermal Constraints, Operational Constraints, Security of Supply, National Initiatives, Early Smart Grid Initiatives, Active Distribution Networks, Virtual Power Plant, Other Initiatives and Demonstrations, Overview of The Technologies Required for The Smart Grid.

UNIT-II

Data communication: Introduction, Dedicated and shared communication channels, Switching techniques, Communication channels, Layered architecture and protocols.

Communication technologies for the Smart Grid: Introduction- Communication technologies- IEEE 802 series, Mobile communications, multi-protocol label switching, Power line communication. Standards for information exchange-Standards for smart metering Modbus, DNP3, IEC 61850.

Information security for the Smart Grid: Encryption and decryption, authentication, Digital signatures, Cyber security standards

UNIT-III

Smart Metering and Advanced Metering infrastructure: Introduction, smart metering, evolution of electricity metering, key components of smart metering, smart meters: an overview of the hardware used – signal acquisition, signal conditioning, analogue to digital conversion, computation, input/output, and communication.

Communication infrastructure and protocols for smart metering- Home area network, Neighborhood Area Network, Data Concentrator, meter data management system, Protocols for communication.

Advanced Metering infrastructure (AMI), AMI protocols – Standards and initiatives.

UNIT-IV

Demand Side Integration and Distribution Management Systems: Demand Side Integration- Services Provided by DSI. Introduction Data Sources and Associated External Systems, SCADA, Customer Information System, Modeling and Analysis Tools, Distribution System Modeling, Topology Analysis, Load Forecasting, Power Flow Analysis, Fault Calculations, Applications, System Monitoring, Operation, Management, Outage Management System.

TEXT BOOKS:

1. Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Smart Grid: Technology and Applications, Wiley Publications, 1st Edition, 2015.
2. James Momoh ,Smart Grid: Fundamentals of Design and Analysis, , Wiley, IEEE Press., 1st Edition, 2016.

REFERENCES:

1. Clark W. Gellings, P.E., The Smart Grid – Enabling Energy efficiency and demand response, CRC Press, Taylor & Francis group, First Indian. 2020.
2. Lars Torsten Berger, Krzysztof Iniewski,Smart Grid – Applications, Communications, and Security ,WILEY, ISBN-13 978-8126557363, 2015.

NPTEL VIDEO LINK:

https://nptel.ac.in/courses/108/107/108107113/

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MACHINE MODELLING AND ANALYSIS
IV B.Tech – VIII Semester (Code: 18EED43)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Evaluation			50	semester End Examination (3 hours)			50

Prerequisites: NIL

Course Objectives:

After completion of this course, students will be able to

- Understand the concepts of 2-axis representation of an electric machine
- Know the concepts of representing transfer function model of Dc machine
- Acknowledge the importance of Voltage and current Equations in stator reference frame
- Develop the modeling Voltage and current Equations in state – space variable form of 3-ph synchronous motor

Course Outcomes : After completion of this course, students will be able to

CO1: Describe the basic methods and assumptions in modelling of two-pole machines.

CO2: categorize the different frames for modelling of AC machines and phase transformations.

CO3: Deduce voltage, current and torque equations for different machines.

CO4: Illustrate Circuits model of a 3ph Synchronous motor and Voltage and current Equations in state – space variable form.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	2	-	-	-	-	-	-	1	3	1	-
CO2	3	3	2	2	2	-	-	-	-	-	-	1	3	1	-
CO3	3	3	2	2	2	-	-	-	-	-	-	1	3	1	-
CO4	3	2	2	2	2	-	-	-	-	-	-	1	3	1	-

UNIT-I

Basic Two-pole DC machine – primitive 2-axis machine – Voltage and Current relationship –Torque equation. Mathematical model of separately excited DC motor and DC Series motor in state variable form – Transfer function of the motor – Numerical problems. Mathematical model of D.C. shunt motor D.C. Compound motor in state variable form – Transfer function of the motor – Numerical Problems

UNIT-II

Liner transformation – Phase transformation (a, b, c to α, β, o) – Active transformation (α .β, o tod, q). Circuit model of a 3 phase Induction motor – Linear transformation – Phase Transformation– Transformation to a Reference frame – Two axis models for induction motor. dq model basedDOL starting of Induction Motors.

UNIT-III

Voltage and current Equations in stator reference frame – equation in Rotor reference frame –equations in a synchronously rotating frame – Torque equation – Equations I state – space form.

UNIT-IV

Circuits model of a 3ph Synchronous motor – Two axis representation of Syn. Motor. Voltage and current Equations in state – space variable form – Torque equation. dq model based short circuit fault analysis- emphasis on voltage, frequency and recovery time.

TEXT BOOKS:

1. Analysis of electric machinery and Drive systems- Paul C. Krause , Oleg Wasynezuk, Scott D. Sudhoff, third edition, IEEE press,2013
2. Generalized Machine theory P.S. Bimbhra, Khanna Publishers, 2002

REFERENCE BOOKS:

1. Thyristor control of Electric Drives – Vedam Subramanyam, Tata McGraw-Hill Education, 1988
2. Power System Stability and Control – Prabha Kundur, EPRI.2006.

ADVANCED ELECTRIC DRIVES
IV B.Tech-VIII Semester (Code: 18EED44)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Evaluation			50	Semester End Examination (3 hours)			50

Prerequisites: Electrical Drives (20EE603/PE62), Power Electronics (20EE504).

Course Objectives: To make the students

- Apply the concepts of DC Motor drive systems.
- Describe the different speed control strategies of Induction Motor drives.
- Describe the different speed control strategies of Permanent Magnet Drives.
- Demonstrate the basic operation of Switched Reluctance Motor Drives.

Course Outcomes: After completion of this course, the student will be able to

CO1: Apply the concepts of DC Motor drive systems.

CO2: Demonstrate the speed control methods of Induction Motor drives.

CO3: Categorize the knowledge of different speed control methods in Permanent Magnet Drives.

CO4: Illustrate the various control methods of Switched Reluctance Motor Drives.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	1	-	-	-	-	-	-	2	3	2	2
CO2	3	3	3	2	1	-	-	-	-	-	-	2	3	3	3
CO3	3	3	3	2	1	-	-	-	-	-	-	2	3	3	3
CO4	3	3	3	2	1	-	-	-	-	-	-	2	3	3	3

UNIT – I

Separately Excited DC-motor Drives: Introduction, Review of DC-motor drives, Speed control of a Separately excited DC motor through state-space Model, drive with controlled rectifiers and choppers, Review of controllers, need for anti-windup feature for integral controllers, Speed control of a separately excited DC drive with inner current loop and outer speed loop, Design of current loop with pole-zero cancellation, Design of speed loop with symmetrical optimization technique.

UNIT – II

Induction Motor drives: Implementation of V/f control with slip compensation scheme, Review of dq0 model of 3-Ph IM with simulation studies, Principle of vector control of IM, Direct Vector control, Indirect vector control with feed-forward, Indirect vector control in various frames of reference, Decoupling of vector control with feed forward compensation, Direct Torque Control of IM, Control of wound rotor induction machine, introduction to five-phase induction motor drives.

UNIT– III

Permanent Magnet Drives: PM Synchronous motors: Types, Construction, operating principle, Expression for torque, Model of PMSM, Implementation of vector control for PMSM, Introduction to BLDC drives.

UNIT – IV

Switched Reluctance Motor Drives: Review of Switched Reluctance Motor, Torque expression, converters for SRM drives, Control of SRM drives with hard and soft chopping techniques.

Text Books:

1. De Doncker, Rik W, Pulle, Duco W.J, Veltman, Andre, Advanced Electrical Drives, Springer; 11th Edition, 2010.
2. Paul C. Krause, Oleg Wasynczuk, Scott D. Sudhoff, Steven D. Pekarek, Analysis of Electric Machinery and Drive Systems, Wiley, 3rd Edition, 2013.

Reference books:

1. G.K. Dubey, Fundamentals of Electrical Drives, Narosa Publishing House Pvt Ltd; 2nd Edition, 2010.
2. Ned Mohan, Advanced Electric Drives: Analysis Control, and Modeling Using MATLAB/Simulink, John Wiley & Sons, 1st Edition, 2014.
3. R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control", Prentice Hall, 1st Edition, 2015.

E-resources and other digital material

1. https://archive.nptel.ac.in/courses/108/104/108104011/
2. https://www.classcentral.com/course/swayam-fundamentals-of-electric-drives-14073

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ENERGY STORAGE SYSTEMS

IV B.Tech-VIII Semester (Code: 18EED51)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Evaluation			50	Semester End Examination (3 hours)			50

Prerequisites: Basic physics and Chemistry

Course objectives: To make the students

- Understand the concepts of Electrical Energy Storage Technologies.
- Gain knowledge about Needs for Electrical Energy Storage.
- Understand the concepts of Features of Energy Storage Systems.
- Understand the concepts of applications of Energy Storage Systems.

Course outcomes: At the end of this course, students will be able to

CO1: Explain the concepts of Electrical Energy Storage Technologies.

CO2: Illustrate the behavior Needs for Electrical Energy Storage.

CO3: Describe the concepts of Features of Energy Storage Systems.

CO4: Demonstrate the concepts of applications of Energy Storage Systems.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	2	2	1	-	-	-	-	-	-	2	3	2	2
CO2	3	2	1	2	-	-	-	-	-	-	-	2	2	2	2
CO3	2	3	1	2	-	-	-	-	-	-	-	2	3	2	2
CO4	3	3	2	-	1	-	-	-	-	-	-	2	2	2	2

UNIT – I

Electrical Energy Storage Technologies: Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, long distance between generation and consumption, Congestion in power grids, Transmission by cable.

UNIT -II

Needs for Electrical Energy Storage: Emerging needs for EES, more renewable energy, less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

UNIT – III

Features of Energy Storage Systems: Classification of EES systems, Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG).

Unit – IV

Application Consideration: Comparing Storage Technologies – Technology options – Performance factors and metrics – Efficiency of Energy Systems – Energy Recovery – Battery Storage System; Introduction with focus on Lead Acid and Lithium – Chemistry of Battery Operation, Power storage calculations, Reversible reactions, Charging patterns, Battery Management systems, System Performance. Areas of Application of Energy Storage: Waste heat recovery, Solar energy storage, green house heating, Power plant applications, Drying and heating for process industries, energy storage in automotive applications in hybrid and electric vehicles.

TEXT BOOKS:

1. Jiujun Zhang, Lei Zhang, Hansan Liu, Andy Sun, Ru-Shi Liu, Electrochemical Technologies for Energy Storage and Conversion, John Wiley and Sons, 2012.
2. Doughty Liaw, Narayan and Srinivasan, Batteries for Renewable Energy Storage,The Electrochemical Society, New Jersy,2010.
3. James M. Eyer, Joseph J. Iannucci and Garth P. Corey, Energy Storage Benefits and Market Analysis", Sandia National Laboratories, 2004.

REFERENCE BOOKS:

1. Jim Eyer, Garth Corey, Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.
2. A. R. Pendse, Energy Storage Science and Technology, SBS Publishers & Distributors Pvt. Ltd., New Delhi, (ISBN – 13:9789380090122), 2011.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC: energy storage systems, https://nptel.ac.in/courses/113/105/113105102/

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INDUSTRIAL ELECTRICAL SYSTEMS

IV B.Tech – VIII Semester (Code: 18EED52)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Evaluation			50	Semester End Examination (3 hours)			50

Course Objectives: To make the students

- Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.
- Understand various components of industrial electrical systems.
- Analyze and select the proper size of various electrical system components.
- Solve problems involving with different AC and DC sources in electrical circuits.

Course Outcomes: After completion of this course, Students will be able to

CO1: Demonstrate the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.
CO2: Infer and outline various components of industrial electrical systems.
CO3: Investigate and analyse the selection the proper size of various electrical system components.
CO4: Illustrate and solve problems involving with different AC and DC sources in Electrical circuits.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	-	-	-	3	3	2	-
CO2	3	3	2	-	-	-	-	-	-	-	-	3	3	2	-
CO3	3	3	2	-	-	-	-	-	-	-	-	3	3	2	-
CO4	3	3	2	-	-	-	-	-	-	-	-	3	3	2	-

UNIT - I

Electrical System Components: LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices.

Residential and Commercial Electrical Systems: Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

UNIT - II

Illumination Systems: Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

UNIT - III

Industrial Electrical Systems I: HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, single line diagram, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

UNIT – IV

Industrial Electrical Systems II: DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Industrial Electrical System Automation: Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

TEXT BOOKS:

1. H. Joshi, Residential, Commercial and Industrial Electrical Systems, McGraw Hill Education, 2007.
2. K. B. Raina, Electrical Design, Estimating & Costing, New age International, 2017.

REFERENCE BOOKS:

1. Surjit Singh, Electric Estimating and Costing, DhanpatRai and Co., 2016.
2. S. L. Uppal and G. C. Garg, “Electrical Wiring, Estimating & Costing”, Khanna publishers, 2008.
3. J. B. Gupta, A Course in Electrical Installation Estimating and Costing, S.K. Kataria& Sons, 2013.

E-resources and other digital material:

https://nptel.ac.in/courses/108101167

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DIGITAL CONTROL SYSTEMS

IV B.Tech–VIII Semester (Code: 18EED53)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Evaluation			50	Semester End Examination (3 hours)			50

Prerequisites: Linear Control Systems

Course Objectives: To make the students

- To understand the concepts of digital control systems and to apply the knowledge state

  variable analysis in the design of discrete systems
- To provide elaborate discussion about analysis of discrete time control systems.
- To explain the concept of stability analysis of discrete time control systems.
- To have an adequate knowledge to design of discrete time systems.

Course Outcomes: After completion of this course, Students will be able to

CO1: Illustrate z–transformations and their role in the mathematical analysis of different Systems (like Laplace transforms in analog systems).

CO2: Describe state space models of discrete time systems and the controllability and Observability of discrete time systems

CO3: Demonstrate the concepts of stability analysis and analyze of discrete time systems.

CO4: Compute controllers for discrete systems in state variable analysis.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	-	-	1	-	-	-	-	1	3	-	-
CO2	3	3	3	2	-	-	1	-	-	-	-	1	3	-	-
CO3	3	3	3	2	-	-	1	-	-	-	-	1	3	3	3
CO4	3	3	3	2	-	-	2	-	-	-	-	1	3	3	3

UNIT – I

Introduction to Sampling and Reconstruction: Introduction, Examples of Data Control Systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.

Z – Transforms: Introduction, Theory of Z-Transform, Inverse Z-Transforms, Modified Z-Transforms, Solutions of linear difference equations.

Z-Plane Analysis of Discrete-Time Control System: Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis
of sampled – data systems, mapping between s-plane and z-plane.

UNIT – II

State Space Analysis State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations.

Controllability and Observability: Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.

UNIT – III

Stability Analysis: Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stability test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.

UNIT – IV

Design of Discrete Time Control System by Conventional Methods: Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.

State Feedback Controllers and Observers: Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula. State Observers – Full order and Reduced order observers.

TEXT BOOKS:

1. K. Ogata, Discrete-Time Control systems, Pearson Education/PHI, 2nd Edition.2003.
2. V. I. George & C. P. Kurian, Digital Control Systems, Cengage India Pvt. Ltd, 2015.

REFERENCE BOOKS:

1. Kuo, Digital Control Systems Oxford University Press, 2003, 2nd Edition.
2. M. Gopal Digital Control and State Variable Methods, Tata McGraw Hill Education Pte. Limited, 2012, 4th Edition.
3. M. Gopal, Digital Control Engineering, New Age Int. Pvt. Ltd., 2014, 2nd Edition.
4. M. Sami Fadali Antonio Visioli Digital Control Engineering Analysis and Design, Academic Press.

NPTEL COURSE LINKS:

1. NPTEL: Electrical Engineering - NOC: https://nptel.ac.in/courses/108103008

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WAVELET TRANSFORMS

IV B.Tech – VIII Semester (Code: 18EED54)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

- Understand the fundamental of signal decomposition using Fourier transform, Short Time Fourier Transform and Wavelet Transform.
- Analyze the signals using discrete wavelet transform.
- Understand the concept of multi-resolution analysis.
- Explain the wavelet reconstruction and applications of wavelet.

Course Outcomes: After completion of this course students will be able to

CO1: Explain the signal decomposition using Fourier transform, Short Time Fourier Transform and Wavelet Transform.

CO2: Analyze the signals using discrete wavelet transform.

CO3: Apply multiresolution analysis to the signals for decomposition.

CO4: Explain the wavelet reconstruction and applications of wavelet.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	2	2	-	-	-	-	-	-	2	3	2	-
CO2	3	2	2	2	2	-	-	-	-	-	-	2	3	2	-
CO3	3	2	2	2	2	-	-	-	-	-	-	2	3	2	-
CO4	3	3	3	2	3	-	-	-	-	-	-	2	3	2	-

UNIT I

Fundamentals of signal decomposition: Stationary and non-stationary signals. brief overview of Fourier transforms, Short-time Fourier transform (STFT). Introduction to wavelets, continuous wavelet transform - definition - scaling – shifting - scale and frequency. CWT as a correlation, time frequency resolution.

UNIT II

Discrete Wavelet Transform: Introduction to the DWT and orthogonal wavelet decomposition. One Stage filtering, Approximation and Details, Filter bank analysis. Multi resolution analysis. orthogonal wavelet decomposition based on the Haar wavelet – digital filter implementation of the Haar wavelet decomposition (Mallat's algorithm).

UNIT III

Multi Resolution Analysis: Construction of a general orthonormal MRA, formal definition, implication of the dilation equation and orthogonality. Introductory concepts of biorthogonal

wavelet basis and wavelet packet synthesis. Two-dimensional wavelet decomposition, regularity, vanishing moments. Multilevel Decomposition, Number of levels

UNIT IV

Wavelet reconstruction: Reconstruction filter, Reconstructing Approximations and details, Multilevel Reconstruction. Signal energy, wavelet-based energy, and power spectra.

Typical Applications: Signal denoising, fault detection and classifications.

TEXT BOOKS:

1. Rao R.M. & Bopardikar A.S., "Wavelet Transforms-Introduction to Theory and Applications", Addison-Wesley, 1998.
2. K P Soman and K. I. Ramachandran, ―Insight into Wavelets from theory to practice, Prentice Hall of India, 2005.
3. Don Hong (Author), Jianzhong Wang (Author), Robert Gardner (Author), Real Analysis with an Introduction to Wavelets and Applications, Academic Press; 1 edition, 2004.

REFERENCE BOOKS:

1. James S. Walker , "A Primer on Wavelets and Their Scientific Applications", Chapman and Hall/CRC, 2 edition, 2008.
2. C S Burrus, A Gopinath, and Haitao Guo, "Introduction to wavelets and wavelet transforms", Pearson, 1st Edition, 1997.
3. S.V. Narasimhan (Author), Nandini Basumallick (Author), S. Veena (Author), Introduction to Wavelet Transform: A Signal Processing Approach, Alpha Science; 1 edition, 2011.

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PROJECT STAGE-II

IV B.Tech-VIII Semester (Code: 18EEP02)

Lectures	0	Tutorial	0	Practical	20	Credits	10
Continuous Internal Evaluation			75	semester End Examination (3 hours)			75

Course Objectives: To make the students

- Implement practical/simulation models by utilization domain knowledge and sciences.
- Illustrate the environment impact and economic feasibility.
- Create advance technologies on proposed model.
- Develop solutions for enhancing the efficiency, reliability and sustainability of the proposed project.

Course Outcomes: After the completion of this course, the students will be able to

CO1: Implement practical/simulation models by applying domain knowledge and scientific principles effectively..

CO2: Assess and illustrate the environmental impact and economic feasibility of proposed models and projects.

CO3: Develop advanced technologies to enhance the proposed models, incorporating innovative solutions and state-of-the-art advancements.

CO4: Develop and implement solutions that enhance the efficiency, reliability, and sustainability of proposed projects.

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	-	-	-	3	3	2	3	3	3	2
CO2	3	3	3	3	3	-	-	2	3	3	-	3	3	3	2
CO3	3	3	3	3	3	-	-	-	3	3	-	3	3	3	-
CO4	3	3	3	3	3	-	-	2	3	3	-	3	3	3	-

The Project stage –II shall be carried out by a batch consisting of around four or five students for one semester. It should help the students to comprehend and apply different theories and technologies that they have learnt. It should lead to a substantial result as a comparative study, a new application of the technologies available or some extension to the works carried out by some researcher and published in referred journals. Each batch must carry out the analysis, design, implementation and testing of the entire project basing on the Electrical Engineering principles. There shall be multiple reviews made by the batch regarding:

- The idea/concept which forms the basis for their project shall be presented to the guide, concerned in-charge and classmates and shall get the approval for Continuation.
- The analysis and design carried out.
- The implementation and the testing done.
- Over all Presentation of the work carried out and the results found out for the valuation under the internal Assessment.

A comprehensive is to be submitted at the end of the semester, which is certified by the concerned guide and the HOD. There shall be an external examiner appointed by the COE to make an assessment and to carry out the Viva-Voce.

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