BAPATLA ENGINEERING COLLEGE
(*Autonomous*)
BAPATLA - 522 101.

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SCHEME & SYLLABI
4 Year B.Tech Program
2010-2011

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
BAPATLA ENGINEERING COLLEGE
(Autonomous)
BAPATLA – 522102

Academic Rules & Regulations

(Effective for students admitted into First year B.Tech. from the academic year 2010-2011).

1. **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, Principal, Bapatla Engineering College (Autonomous), shall be the Chairman of the College Academic Council.

2. ADMISSIONS:

1. **Admission to First year of any Four Year B.Tech Programmes of study in Engineering:** Admissions into 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 Acharya Nagarjuna University & Govt. of Andhra Pradesh.

2. **Admission to the Second year of any Four year B.Tech Programme of study in Engineering:** Admissions into second year of B.Tech Programme of B.E.C will be as per the norms stipulated by Acharya Nagarjuna University & Govt. of Andhra Pradesh.

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 desires to pursue study 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 syllabus to revised syllabus.
   3. When a student after long discontinuity rejoins the college to complete his Programme of study for the award of a degree.
   4. When a student is not able to pursue his/her existing Programme of study but wishes to get transferred to another Programme of study.

   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. 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 given in ***5.3.***

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

4. **MINIMUM INSTRUCTION DAYS: Each semester shall consist of a minimum of 110 working days which includes instruction, term examinations and final examinations.**

5. **B.Tech. Programmes of study:**

   1. The Four year B.Tech Programme is offered in the following branches of study:

      1. Biotechnology.
      2. Chemical Engineering.
      3. Civil Engineering.

4. Computer Science & Engineering.
5. Electrical & Electronics Engineering.
6. Electronics & Communication Engineering.
7. Electronics & Instrumentation Engineering.
8. Information Technology.
9. Mechanical Engineering.

1. Structure of the Programme:

   1. Each Programme of a Discipline or branch of study shall consist of:

   1. General core courses in Basic Sciences, Engineering Sciences, Humanities, Mathematics and Management.
   2. Interdisciplinary courses in Engineering, to impart the fundamentals of Engineering to the student.
   3. Compulsory core courses to impart broad based knowledge needed in the concerned branch of study.
   4. Elective courses from either discipline or interdisciplinary areas to be taken by the student based on his/her interest and specialization preferred.
   5. A Term paper and a Project approved by the Department to be submitted in the fourth year of study.

      Every Programme of study shall be designed to have 45-50 theory courses and 20-25 laboratory courses and the distribution of types of courses from the above is indicated in the following table.

General Core courses	20 -35%
Interdisciplinary courses in engineering	15-25%
Compulsory Core courses in the branch of study	45-55%
Elective Courses	10-15%

   ***Note**: All components prescribed in the curriculum of any Programme of study shall be conducted and evaluated.*

   2. Contact hours: Depending on the complexity and volume of the course the number of contact hours per week will be determined.

   3. Credits: Credits are assigned to each course as per norms mentioned in the following table.

Subject	**Credits**
Theory Course (3 Theory Periods/Week)	03
Theory Course (More than 3 Theory Periods/Week)	04
Laboratory Course	02
Term paper	02
Final year Project	10

2. 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 B.E.C.
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.

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

1. Curriculum for each Programme of study:

1. The Four year curriculum of any B.Tech Programme of study in any branch of engineering is formulated based on the guidelines mentioned in 5.2 and will be recommended by the concerned Board of Studies and is approved by the Academic council of the college.
2. In case of students admitted under lateral entry, the respective regular curriculum contents from second year onwards are to be pursued by them.
3. In case of students admitted under advanced standing, the Programme curriculum will be prepared by the concerned Board of Studies and the Academic Council has to approve the same.
4. After approval from the Academic Council, Programme curriculum for the same shall be prepared and made available to all the students along with the academic regulations.

2. The Maximum duration permitted and cancellation of admission:

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 first year of any Programme and
2. Six academic years in sequence from the year of admission for a Lateral entry student admitted into 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.

2. In case, any student fails to meet the applicable conditions for the eligibility of degree in the maximum stipulated period as in ***5.5.1***, his/her admission stands cancelled.

5. EXAMINATION SYSTEM & EVALUATION:

1. 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 ***11.0.*** The performance of a student in each course is assessed with assignment tests, term examinations on a continuous basis during the semester called Continuous Assessment (CA) and a Final Examination (FE) conducted at the

end of the semester. For each theory, design and/or drawing course, there shall be a comprehensive Final Examination (FE) of three hours duration at the end of each Semester, except where stated otherwise in the detailed Scheme of Instruction.

2. The distribution of marks between Continuous Assessment(CA) and Final Examination(FE) to be conducted at the end of the semester will be as follows:

Nature of the course	CA	FE
Theory subjects	40	60
Drawing	40	60
Practicals	40	60
Term Paper	40	60
Project work	50	100

3. Continuous Assessment (CA) in Theory and Drawing subjects:

   1. In each Semester there shall be two Term examinations and two Assignment Tests in every theory course. The duration of the Assignment Test shall be 45 minutes and that of the Term Examination shall be 90 minutes. Assignment sheets shall be given at least one week in advance of the commencement of the tests. Students shall answer the question(s) [or question(s) similar in model] from the Assignment sheet stapled to or printed on the script which is distributed in the examination hall.

      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, Assignment Tests and the calculation of marks for CA in a theory course is given in the following table.

Weightage for different heads to calculate CA for 40 marks in a Theory course			
	Term Exams (Max. 20 marks)	Assignment Tests (M 15 marks)	Attendance (Max. 5 marks)
Better Performed test/exam	13	10	5
Other test/exam	7	5	

   2. For drawing courses, there shall be only two Term examinations in a semester with no Assignment Tests. In case of such courses a maximum of 15 marks shall be given for day-to-day class work and a maximum of 20 marks shall be awarded to the Term examinations taking into account the performance of both the Term examinations giving weightage of 13 marks for the Term Examination in which the student scores more marks and the remaining 7 marks for the other term examination.

   3. A maximum weightage of 5 marks will be given in the CA for attendance in all theory and drawing courses as indicated in ***7.1.1.***

4. Final Examination (FE) in Theory and Drawing subjects:

   1. For each theory, design and/or drawing course, there shall be a comprehensive Final Examination (FE) of three hours duration at the end of each Semester for 60

marks, except where stated otherwise in the detailed Scheme of Instruction. Question paper setting shall be entrusted to external examiners from the panels approved by the respective Boards of Studies.

1. A minimum of 24 marks (40%) are to be secured exclusively in the final examination (FE) of theory/drawing course and a minimum total of 40 marks in FE and CA put together in a theory / drawing course is to be secured in order to be declared as passed in that course and for the award of the grade in the course.

5. Continuous Assessment (CA) in laboratory courses:

    1. The evaluation for Laboratory course is based on CA & FE. The CA for 40 marks comprises of 20 marks for day to day laboratory work, 5 marks for record submission and 15 marks for a laboratory examination at the end of the semester.

    2. 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 concerned internal lab teacher and the Head of the Department to be eligible to appear for the Final Examination in that laboratory course.

6. Final Examination (FE) in laboratory courses:

    1. For each laboratory course, the final examination (FE) 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 FE is for 60 marks which include 30 marks for a lab experiment/exercise, 20 marks for Viva-voce and 10 marks for the certified record.

    2. A minimum of 30 marks (50%) shall be obtained in FE and a minimum total of 40 marks in FE and CE put together in a laboratory course are to be secured in order to be declared as passed in the laboratory course and for the award of the grade in that laboratory course.

7. Evaluation of term paper:

    1. A term paper is to be submitted by each student in the 7^{th} semester which would be a precursor to the project work to be done in the 8^{th} semester. The evaluation is based on CA for 40 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 20 marks.

    1. The final examination (FE) shall be conducted for 60 marks by one internal and one external examiner appointed by the Principal. The FE contains Viva-voce and the demonstration of the model developed or work performed as a part of the term paper.

    2. A minimum of 30 marks (50%) shall be obtained in FE and a minimum total of 40 marks in FE and CE put together in the term paper are to be secured in order to be declared as passed in the term paper and for the award of the grade in the term paper.

2. Evaluation of Project:

1. In case of the Project work, the evaluation shall be based on CA and FE. The CA for 50 marks consists of a minimum of two Seminars/ presentations for 25 marks and the Project Report submitted at the end of the semester which is evaluated for 25 marks.

2. FE shall be 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. A minimum of 50 marks shall be obtained in FE exclusively and a minimum total of 60 marks in FE and CE put together are to be secured in order to be declared as passed in the Project and for the award of the grade.

3. A student who could not secure a minimum of 50% aggregate marks in CA of a semester is not eligible to appear for the Final Examinations conducted at the end of the semester and shall have to repeat that semester.

   NOTE : A student who is absent for any Test / Exam / Seminar / Presentation as a part of Continuous Assessment (CA), 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.

4. Make-up Test: A student can appear for a Make-up Test in a single theory subject of a semester to improve marks in the Continuous Assessment – (CA/Internal marks) subject to the following:

If the student becomes eligible to appear for the Final Examination (FE) of a semester and is unable to secure 40% internal marks in a particular theory subject due to genuine reasons, he/she may get an opportunity to appear for makeup test in any one subject in that semester. The makeup test will be conducted for 40 marks and the marks obtained in this test are final. However, the maximum mark awarded will be 16 only irrespective of the marks obtained in the makeup test. Such students have to apply by paying a fee prescribed by the institution and submit the application along with a letter of request indicating the genuineness of his/her candidature to be eligible for the makeup test. Applications should be recommended by the concerned HOD and approved by the principal.

2. **ATTENDANCE REGULATIONS:**

1. Regular course of study means a minimum average attendance of 75% in all the courses of study prescribed for a semester in the curriculum, computed by considering total number of hours / periods conducted in all courses as the denominator and the total number of hours / periods actually attended by the student in all courses, as the numerator.

   1. A maximum of 5 marks weightage in CA in each theory/drawing course shall be given for those students who put in a minimum of 75% attendance in the respective theory/drawing course in a graded manner as indicated below:

Attendance of 75% and above but less than 80%	1 mark
Attendance of 80% and above but less than 85%	2 marks
Attendance of 85% and above but less than 90%	3 marks
Attendance of 90% and above	5 marks

2. Condonation of shortage in attendance may be recommended on genuine medical grounds, up to a maximum of 10% provided the student puts in at least 65% attendance as calculated in *7.1* above and provided the principal is satisfied with the genuineness of the reasons.

3. A student, who could not satisfy the minimum attendance requirements, as given above, in any semester, is not eligible to appear for the Final examinations and shall have to repeat that semester.

3. **DETENTION:** A student is said to have been detained and not allowed to appear for Final Examination(FE) at the end of the semester when

1. The student does not have a minimum 75% attendance or 65% attendance with condonation in all subjects put together in that semester or the student has not scored a minimum of 50% of marks in CA in all the courses of that semester put together.

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

4. **CONDITIONS FOR PROMOTION:**

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.

2. A student shall be eligible for promotion to II year 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 I year B.Tech.

3. A student shall be eligible for promotion to III year of B.Tech. Programme if he/she is not detained in the second semester of II year B.Tech. Programme and has passed all but **three** courses of I year B.Tech. (including laboratory course).
4. A student shall be eligible for promotion to IV year of B.Tech. Programme if he/she is not detained in the second semester of III year B.Tech. Programme and has passed all but **three** courses of II B.Tech. (including laboratory course) and all but **one** course of I B.Tech. (including laboratory course).

5. **Registration:** Every eligible student (not detained and promoted) 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.

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

6. **GRADING SYSTEM**

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

Table: Grades & Grade Points

Grade	Grade points	% of Marks
O	10	90% and above
A+	9	80% – 89%
A	8	70% – 79%
B+	7	60% – 69%
B	6	50% – 59%
C	5	40% – 49%
F	Failed, 0	Less than 40%

2. A student who earns a minimum of 5 grade points (C 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 in 6.0**.

7. **GRADE POINT AVERAGE**

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.

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.

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 the particular point of time.

8. **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 5.0 (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.

5. **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	**≥ 7.0**
Second Class	**≥ 6.0**
Pass	**≥ 5.0**

* 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**.

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.

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.

3. Candidates shall be permitted to apply for recounting/revaluation of FE scripts within the stipulated period with payment of prescribed fee.

4. The Governing Body of B.E.C (Autonomous) has to approve and recommend to the Acharya Nagarjuna University for the award of a degree to any student.

6. IMPROVEMENT OF CLASS:

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 aggregate and the class. But this reappearance shall be within a period of two academic years after becoming eligible for the award of the Degree.

   However, this facility shall not be availed of by a candidate who has taken the Original Degree Certificate. Candidates shall not be permitted to reappear either for CA in any course or for Final Examinations (FE) in laboratory courses (including Project Viva-voce) for the purpose of improvement.

7. **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. A student can appear for any number of supplementary examinations till he/she clears all courses which he/she could not clear in the first attempt. However the maximum stipulated period cannot be relaxed under any circumstances.

8. **INSTANT SUPPLEMENTARY EXAMINATIONS:** Candidates who fail in one theory course of 4^{th} year 2^{nd} semester can appear for Instant Supplementary Examination conducted after declaration of the revaluation results of the said exam.

9. MALPRACTICES:

The Principal shall refer the cases of malpractices in Continuous Assessments (CA) and Final Examinations (FE) to an Enquiry Committee constituted by him / her. The Committee will submit a report on the malpractice committed by the student to the Principal. The Principal along with the members of the Committee is authorised to award a suitable punishment.

10. ADDITIONAL ACADEMIC REGULATIONS:

1. Any attempt to impress upon the teachers, examiners, faculty and staff of Examinations, bribing for either marks or attendance will be treated as malpractice.
2. When a student is absent for final examination, he/she is treated as to have appeared and obtained zero marks in that component and Grading is done so.
3. When a component of Continuous Assessment (CA) or Final Examination (FE) is cancelled as a penalty, he/she is awarded zero marks in that component.

11. AMENDMENTS TO REGULATIONS:

The Academic Council of Bapatla Engineering College (Autonomous) reserves the right to revise, amend or change the Regulations, Schemes of Examinations, and/ or Syllabi or any other matter pertained suitable to the needs of the students, society and industry without any notice.

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BAPATLA ENGINEERING COLLEGE (AUTONOMOUS)
Affiliated to Nagarjuna University:: Nagarjuna Nagar
SCHEME FOR ELECTRICAL & ELECTRONICS ENGINEERING (w.e.f 2010-2011)
I/IV B.TECH (EEE):: SEMESTER - I

Code No.	Subject	Scheme of Instruction (Periods per week)			Scheme of Examination (Maximum marks)			No. of Credits
		Theory	Tutorial	Lab	CA	FE	Total Marks	
EE111/ MA01	Mathematics-I	4	1		40	60	100	4
EE112/ PH 01	Engineering Physics-I	3	1		40	60	100	3
EE113/ CY 01	Engineering Chemistry-I	3	1		40	60	100	3
EE114/ EN 01	English Language and Communication	3	1		40	60	100	3
EE115/ BT 01	Environmental Studies	3	-		40	60	100	3
EE116/ ME 01	Engineering Graphics	3	3		40	60	100	3
EE151/ PHL01	Physics Laboratory-I	-	-	3	40	60	100	2
EE152/ CYL01	Chemistry Laboratory-I	-	-	3	40	60	100	2
EE153/ MEL01	Work Shop	-	-	3	40	60	100	2
	TOTAL	19	7	9	360	540	900	25

CA: Continuous Assessment **FE:** Final Examination

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Affiliated to Nagarjuna University:: Nagarjuna Nagar
SCHEME FOR ELECTRICAL & ELECTRONICS ENGINEERING (w.e.f 2010-2011)
I/IV B.TECH (EEE):: SEMESTER – II

Code No.	Subject	Scheme of Instruction (Periods per week)			Scheme of Examination (Maximum marks)			No. of Credits
		Theory	Tutorial	Lab	CA	FE	Total Marks	
EE121/ MA 02	Mathematics-II	4	1		40	60	100	4
EE122/ PH 02	Engineering Physics-II	3	1		40	60	100	3
EE123/ CY 02	Engineering Chemistry-II	3	1		40	60	100	3
EE124	Basic Electrical Science	3	1		40	60	100	3
EE125/ CE 01	Engineering Mechanics	4	1		40	60	100	4
EE126/ CS 01	Computer Programming with C	4	1		40	60	100	4
EE161/ PH/CY L01	Physics & Chemistry Laboratory-II	-	-	3	40	60	100	2
EE162/ EN L01	English Language Laboratory	-	-	3	40	60	100	2
EE163/ CS L01	Computer Programming Lab	-	-	3	40	60	100	2
	TOTAL	21	6	9	360	540	900	27

CA: Continuous Assessment **FE:** Final Examination

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SCHEME OF INSTRUCTION & EXAMINATION
FOR
ELECTRICAL & ELECTRONICS ENGINEERING
w.e.f 2010-2011 (Semester System)

Second Year B.Tech., (SEMESTER – I)

Code No.	Subject	Scheme of Instruction (Periods per week)			Scheme of Examination (Maximum marks)			No. of Credits
		Theory	Tutorial	Lab	CA	FE	Total Marks	
EE211 / MA03	Mathematics – III	4	-		40	60	100	4
EE212	Circuit Theory-I	4	1		40	60	100	4
EE213 / EC02	Electronic Devices	3	1		40	60	100	3
EE214 / ME04	Prime Movers and Pumps	3	1		40	60	100	3
EE215 /EC03	Digital Electronics	4	1		40	60	100	4
EE216	Electro Mechanics – I	4	1		40	60	100	4
EE251	Electro Mechanics Lab–I	-		3	40	60	100	2
EE252 / ECL05	Electronics Lab – I	-		3	40	60	100	2
EE253	Electrical Work Shop	-		3	40	60	100	2
	TOTAL	**22**	**5**	9	360	540	900	28

CA: Continuous Assessment **FE:** Final Examination

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w.e.f 2010-2011 (Semester System)

Second Year B.Tech., (SEMESTER – II)

Code No.	Subject	Scheme of Instruction (Periods per week)			Scheme of Examination (Maximum marks)			No. of Credits
		Theory	Tutorial	Lab	CA	FE	Total Marks	
EE221 /MA04	Mathematics – IV	4	-		40	60	100	4
EE222 / EC05	Electronic Circuits-I	4	1		40	60	100	4
EE223 / IT01	OOPS & OS	4	-		40	60	100	4
EE224	Circuit Theory-II	4	1		40	60	100	4
EE225	Electromagnetic Field Theory	4	1		40	60	100	4
EE226	Electro Mechanics – II	4	-		40	60	100	4
EE261	Electro Mechanics Lab-II	-	-	3	40	60	100	2
EE262 / MEL03	Fluid Mechanics & IC Engines Lab	-	-	3	40	60	100	2
EE263 / ITL01	Object Oriented Programming Lab	-	-	3	40	60	100	2
	TOTAL	**24**	**3**	9	360	540	900	30

CA: Continuous Assessment **FE:** Final Examination

BAPATLA ENGINEERING COLLEGE: BAPATLA
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SCHEME OF INSTRUCTION & EXAMINATION
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ELECTRICAL & ELECTRONICS ENGINEERING
w.e.f 2011-2012 (Semester System)

Third Year B.Tech. (SEMESTER – I)

Code No.	Subject	Scheme of Instruction (Periods per week)			Scheme of Examination (Maximum marks)			No. of Credits
		Theory	Tutorial	Lab	CA	FE	Total Marks	
EE311/EC06	Linear ICs and Applications	4	1	-	40	60	100	3
EE312	Transmission & Distribution	4	1	-	40	60	100	4
EE313/EC07	Electronic Circuits-II	4	-	-	40	60	100	3
EE314	Generation of Electrical Power	4	-	-	40	60	100	4
EE315	Electrical Measurements	4	-	-	40	60	100	3
EE316	Electro Mechanics - III	4	1	-	40	60	100	4
EE351	Electrical Measurements Lab	-		3	40	60	100	2
EE352	Electronics Lab - II	-		3	40	60	100	2
EE353	Soft Skills Lab	-		3	40	60	100	2
	TOTAL	**24**	**3**	**9**	360	540	900	**27**

CA: Continuous Assessment **FE:** Final Examination

BAPATLA ENGINEERING COLLEGE : BAPATLA
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SCHEME OF INSTRUCTION & EXAMINATION
FOR
ELECTRICAL & ELECTRONICS ENGINEERING
w.e.f 2011-2012 (Semester System)

Third Year B.Tech., (SEMESTER – II)

Code No.	Subject	Scheme of Instruction (Periods per week)			Scheme of Examination (Maximum marks)			No. of Credits
		Theory	Tutorial	Lab	CA	FE	Total Marks	
EE 321	Professional Ethics and Human Values	3	1	-	40	60	100	3
EE 322	Microprocessors and Microcontrollers	4	1	-	40	60	100	3
EE 323	Power System Analysis	4	-	-	40	60	100	4
EE 324	Power Electronics	4	1	-	40	60	100	4
EE 325	Control systems	4	1	-	40	60	100	4
EE 326	Elective-I	4	-	-	40	60	100	3
EE 361	Electro Mechanics Lab- III	-		3	40	60	100	2
EE 362	Microprocessors and Microcontrollers Lab	-		3	40	60	100	2
EE 363	Control Systems Lab	-		3	40	60	100	2
	TOTAL	**23**	**4**	**9**	360	540	900	**27**

CA: Continuous Assessment **FE:** Final Examination

Elective-I
EE326 (A): Digital Signal Processing
EE326 (B): Advanced Control Systems
EE326 (C): Computer networks
EE326 (D): Artificial Neural Networks

BAPATLA ENGINEERING COLLEGE: BAPATLA
(Autonomous)
SCHEME OF INSTRUCTION & EXAMINATION
FOR
ELECTRICAL & ELECTRONICS ENGINEERING
w.e.f 2011-2012 (Semester System)

Fourth Year B.Tech., (SEMESTER – I)

Code No.	Subject	Scheme of Instruction (Periods per week)			Scheme of Examination (Maximum marks)			No. of Credits
		Theory	Tutorial	Lab	CA	FE	Total Marks	
EE 411	Industrial Management & Entrepreneurship Development	3	1	-	40	60	100	3
EE 412	Power System Operation Control& Stability	4	-	-	40	60	100	4
EE 413	Utilization of Electrical Power	4	1	-	40	60	100	4
EE 414	Switch Gear & Protection	4	1	-	40	60	100	4
EE 415	Elective-II	4	1	-	40	60	100	4
EE 416	Open Elective	3	1	-	40	60	100	3
EE 451	Term Paper	-	-	3	40	60	100	2
EE 452	Power Electronics Lab	-	-	3	40	60	100	2
EE 453	Computer Simulation of Electrical Systems Lab	-	-	3	40	60	100	2
	TOTAL	**22**	**5**	**9**	**370**	**480**	**850**	**28**

CA: Continuous Assessment **FE:** Final Examination

The Students of EEE will choose one of the Open Electives offered by other Departments. For details see the list of Open Electives offered by other departments in Page Number: 21

Elective -II:

EE415 (A): Electrical Power Distribution Systems Engineering
EE415 (B): Energy Conservation and Audit
EE415(C): Process Control & Instrumentation
EE415 (D): Fuzzy Logic and Applications

LIST OF OPEN ELECTIVES

DEPARTMENT	SUBJECT NAME	SUBJECT CODE
Biotechnology.	Intellectual Property Rights, Patent Laws &Ethical Issues	BT 100
	Bioinformatics Algorithms	BT 200
Chemical Engineering.	Industrial Pollution & Control	ChE 100
	Energy Engineering	ChE 200
Civil Engineering.	Air Pollution & Control	CE 100
	Remote Sensing & GIS	CE 200
Computer Science & Engineering.	Database Management Systems	CS 100
	Java Programming	CS 200
Electrical & Electronics Engineering.	Optimization Techniques	EE 100
	Non-Conventional Energy Sources	EE 200
Electronics & Communication Engineering.	Consumer Electronics	EC 100
	Embedded Systems	EC 200
Electronics & Instrumentation Engineering.	Virtual Instrumentation Using LABVIEW	EI 100
	Sensors & Transducers	EI 200
Information Technology.	Mobile Application Development	IT 100
	.Net Technologies	IT 200
Mechanical Engineering.	Robotics	ME 100
	Power Plant Engineering	ME 200
BOSCH REXROTH Centre	Automation Technology	BR 100

BAPATLA ENGINEERING COLLEGE: BAPATLA
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SCHEME OF INSTRUCTION & EXAMINATION
FOR
ELECTRICAL & ELECTRONICS ENGINEERING
w.e.f 2011-2012 (Semester System)

Fourth Year B.Tech (SEMESTER – II)

Code No.	Subject	Scheme of Instruction (Periods per week)			Scheme of Examination (Maximum marks)			No. of Credits
		Theory	Tutorial	Lab	CA	FE	Total Marks	
EE 421	Industrial Drives	4	1	-	40	60	100	4
EE 422	Computer Aided Power System Analysis	4	-	-	40	60	100	4
EE 423	Elective-III	4	1	-	40	60	100	4
EE 424	Elective-IV	4	-	-	40	60	100	4
EE 461	Project Work	-	-	9	50	100	150	10
EE 462	Power Systems Lab	-	-	3	40	60	100	2
	TOTAL	**16**	**2**	**12**	**250**	**400**	**650**	**28**

CA: Continuous Assessment **FE:** Final Examination

Elective- III

EE423 (A): High Voltage Engineering
EE423 (B): Electrical Machine Design
EE423(C): Embedded Systems and VLSI

Elective- IV

EE424 (A): FACTS Controllers
EE424 (B): Computer Organization
EE424(C): HVDC Transmission

MATHEMATICS – I

(Common for all branches)

EE111/MA01

I B.Tech I Semester

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT - I

Matrix Algebra: Rank of a Matrix, Linear Independence, Vector Space, Solutions of Linear Systems, Inverse of a Matrix by Gauss-Jordan Elimination, Vector Spaces, Inner Product Spaces, Linear Transformations. Eigen Values, Eigen Vectors, Some applications of Eigen value problems. Symmetric, Skew-Symmetric and Orthogonal Matrices.

UNIT - II

Matrix Algebra: Complex Matrices: Hermitian, Skew-Hermitian and Unitary.
Similarity of Matrices, Basis of Eigen Vectors, Diagonalization.

Differential Calculus: Rolle's Theorem, Lagrange's Mean Value Theorem and Taylor's Theorem (without Proofs), Taylor's and, Maclaurin's Series for functions of one variable. Maxima and Minima of functions of Two Variables, Lagrange's method of Multipliers.

UNIT - III

First Order Differential Equations: Basic concepts, Geometrical meaning, Separable Differential Equations, Exact Differential Equations, Integrating Factors, Linear Differential Equations, Bernoulli's Equation, Orthogonal Trajectories of curves, Some Engineering Applications: Growth-Decay and Newton's Law of Cooling.

UNIT - IV

Linear Differential Equations of Second Order: Homogeneous Linear Equations of Second Order, Second Order Homogeneous Equations with Constant Coefficients, Case of Complex Roots, Euler-Cauchy Equations, Non-Homogeneous Equations, Solution by Undetermined Coefficients, Solution by Variation of Parameters, Applications-Modeling of Electric Circuits.

TEXT BOOK:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons.

REFERENCE BOOK:

1. George B, Thomas, Jr. and Ross L. Finney, "Calculus and Analytic Geometry", Addison Wesley.

ENGINEERING PHYSICS – I

(Common to all branches)

EE 112/ PH01

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

OPTICS (11 Periods)

INTERFERENCE: Two-wave interference, coherence, cosine law, Michelson interferometer and its applications, (determination of wavelengths of monochromatic light and resolution of two nearby wavelengths).

DIFFRACTION: Fresnel & Fraunhoffer diffraction, fraunhoffer diffraction due to single slit, plane diffraction grating, dispersive and resolving power of grating.

POLARISATION: Introduction, Brewester's and Malus law, double refraction, Nicol prism, quarter wave plate, half wave plate.

UNIT – II

LASERS & FIBER OPTICS (10Periods)

LASERS: Properties of lasers**,** Spontaneous and stimulated emission, Population inversion, active medium, Solid state (Ruby) laser, Gas(He-Ne) laser, semiconductor (Ga-As) laser, Applications.

HOLOGRAPHY: Principle, recording and reproduction of holography, Applications.

FIBER OPTICS: Structure and types of optical fibers, acceptance angle, Numerical aperture, fiber optic communication and its advantages.

UNIT – III

ELECTRICITY & MAGNETISM (10 Periods)

Gauss's law in static electricity (qualitative only), Gauss's law of magnetism, circulating charges, Cyclotron-constructing, working and limitations, Hall effect and its applications, displacement current, Maxwell's equations (qualitative treatment), E M oscillations, velocity of EM waves, energy transport and the pointing vector, radiation pressure, AC circuit containing series LCR circuit-resonance condition.

UNIT – IV

MODERN PHYSICS (11 Periods)

Dual nature of light, de-Brogli's concept of matter waves, Davison-Germer electron diffraction experiment, Heisenberg's uncertainty experiment and applications (non-existence of electron in a nucleus and finite width of spectral lines), one dimensional time- independent Schrödinger wave equation, physical significance of wave function, applications of time-independent wave equation to particle in a box(one dimensional), tunneling, the scanning tunneling microscope.

TEXT BOOKS:

1. R.K Goure and S.C. Gupta, "Engineering Physics", New Delhi.
2. Halliday, Resnik, Krane, "PHYSICS", John Wiley & Sons.

REFERENCE BOOKS:

1. "Optics", A. Ghatak (TMH).
2. "Concepts of Modern Physics", Aurthur Beiser (TMG).
3. "A text book of engineering physics", M.N. Avadhanulu, P.G. Kshirasagar, S.Chand & Co.,.
4. Serway and jewett, "Physics for scientist and engineers with Modern physics", 6^{th} edition, Tomson Brooks/Cole, Indian reprint.

ENGINEERING CHEMISTRY – I

(Common to all branches)
EE113/CY01

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

WATER TECHNOLOGY (11 Periods)

Characteristics – alkalinity – types of alkalinity and determination – hardness – types and estimation by EDTA method (problems); Domestic water treatment – disinfection methods (Chlorination, ozonation. UV treatment) – Boiler feed water – requirements – disadvantages of using hard water in boilers: Scales, Sludges, Caustic embrittlement, boiler corrosion, Priming and foaming – internal conditioning (phosphate, calgon and carbonate conditioning methods) – external conditioning –demineralization process –Lime Soda Process-desalination of brackish water by electro dialysis and reverse osmosis.

UNIT – II

POLYMERS: (12 Periods)

Polymers: Definition, Polymerization, types, addition and condensation polymerization, free radical polymerization mechanism.

Plastics: Classification, Preparation, Properties and uses of PVC, Teflon, polycarbonate, polyurethane, nylon-6,6, PET.

Rubber: vulcanization of rubber, synthetic Rubbers: Buna-S, Buna-N and Polyurethane rubbers.

SURFACE CHEMISTRY:

Surface Chemistry: Solid surfaces, types of adsorption, Frendlich and Longmuir adsorption isotherm, BET adsorption equip. Calculation of surface area of solid & application adsorption: role of adsorbents in catalysis, ion-exchange adsorption and pollution abatement; classification of colloids, Electrical & optical properties micelles, applications of colloids in industry.

UNIT – III

(11 Periods)

RENWEBLE AND NON RENWEABLE ENERGY SOURCES

Thermal and Chemical energy: Introduction to solid fuels - calorific value (lower, higher)-determination of calorific value(Bomb Calorimeter) - pulverized coal – carbonization (Bee Haive method - Otto Hoffman by product method)- Proximate and ultimate analysis of coal - Flow Chart in Thermal Power Stations.- Introduction to Geo Thermal Energy-working – applications-Introduction to Solar Cells –Solar Panels-Applications-Green House Concept - wind energy – fuel cells – hydrogen – oxygen fuel cell – batteries – alkaline batteries – lead–acid, nickel–cadmium and lithium batteries.

UNIT – IV

ENGINEERING MATERIALS (11 Periods)

Refractories – classification – acidic, basic and neutral refractories – properties: refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling – manufacture of alumina, magnesite and zirconia bricks, Abrasives – natural and synthetic abrasives – quartz, corundum, emery, garnet, diamond, silicon carbide and boron carbide.
Composites: definition, types, polymer matrix composites.
Lubricants – mechanism of lubrication, liquid lubricants - properties: viscosity index, flash and fire points, cloud and pour points, oiliness –solid lubricants – graphite and molybdenum sulphide.
Nanomaterials: Introduction to nanochemistry – preparation of few Nano materials:carbon nanotubes, Fullerenes etc – Properties of Nano materialas and their Engineering applications.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S. Dara & & Mukkati K., "A text book of engineering chemistry", S.Chand & Co.Ltd., New Delhi (2006).
3. "Text Books of Engineering Chemistry", C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).

REFERENCE BOOKS:

1. B.K.Sharma, "Engineering chemistry", Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
3. "Enginering Chemistry", J.C. Kuriacase & J. Rajaram, Tata McGraw Hills co., New Delhi 1. (2004).
4. "Chemistry of Engineering Meterials", R.P Mani and K.N.Mishra, CENGAGE learning.
5. "Applied Chemistry – A text for Engineering & Technology", Springar (2005).
6. "Text Book of Engineering Chemistry", Shasi Chawla, Dhantpat Rai Publishing Company, NewDelhi (2008).
7. "Engineering Chemistry", R. Gopalan, D. Venkatappayya, D.V. Sulochana Nagarajan, Vikas Publishers (2008).

ENGLISH LANGUAGE AND COMMUNICATION

(Common to all branches)

EE 114/ EN01

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Objective of the course

To impart Basic skills of communication in English in through intensive practice to the First year student, So as to enable them to function confidently and effectively in that language in the professional sphere of their life.

Unit – 1

Grammar: This area exposes the learners to improve the standard proficiency level, avoiding grammatical mistake in communication.

1. Tenses
2. Preposition
3. Parts of speech

Unit – 2

Writing skills: This area promotes a format and well structured sentences required in professional writing

1. Paragraph writing
2. Letter writing
3. Essay writing

Unit – 3

Vocabulary: This unit offers an extensive knowledge of words and word meaning, essential for communication and contemporary test

1. Analogies
2. Idioms and phrases and their use
3. Antonyms & Synonyms

Unit – 4

Reading skills: Reading skills enable the student to turn writing into meaning and achieve the goals of reading independently, comprehensibly and fluently

1. Reading comprehension
1. Scanning
2. Skimming
3. Glance

TEXT BOOK:

1. "Objective English for Competitive Examination (Third edition)", Hari Mohan Prasad, Uma Reni Sinha, Tata McGraw Hill.

REFFRENCE BOOKS:

1. "Effective Technical Communication", M.Ashraf Rizvi, Tata McGraw Hill.
2. "Cambridge Preparation Guide for TOFEL".
3. "Dictionary of Technical Terms".
4. "Cambridge Advanced Learner's Dictionary".
5. "Cambridge Idioms Dictionary".
6. "Basic Correspondence & Report Writing", Sharma, Tata Mc Graw Hill.
7. "Business Correspondences and Report Writing", R.C.Sharma, Krishna Mohan, Tata McGraw Hill.
8. "Dictionary of Misspelled and Easily Confused Words", David Downing, Deborah K.Williams, Tata McGraw Hill.

ENVIRONMENTAL STUDIES

(Common for all branches)

EE 115/BT 01

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Introduction: Definition, Scope and Importance, Need for public awareness.

Ecosystems: Introduction, types, Structure and Functions of Ecosystems, Forest, Grassland, Desert, Aquatic (lakes, rivers and estuaries).

Biodiversity: Definition and Classification of Biodiversity, Biological Classification of India, India as a mega diversity nation and Hot Spots of Biodiversity.

Values of Biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values.

Threats to Biodiversity: Habitat loss, Extinction of Species, Poaching of wildlife.

Conservation of Biodiversity: In-situ and Ex-situ conservation of biodiversity

UNIT – II

Natural Resources: Exploitation and Related Pollution Problems

Land: Land as a resource, causes and effects of land degradation.

Forest: Use of forests, causes and effects of deforestation and conservation of forests.

Water: Distribution of Water Resources, floods and drought, Rain water harvesting, causes, effects and control of water pollution.

Energy: Classification of Resources, Importance of energy, causes and effects of nuclear pollution Causes, Effects and Control of Air Pollution and Noise Pollution.

Solid Waste Management: Urban and Industrial wastes, Composting and Vermiculture and 3 R - approach.

UNIT – III

Sustainability: Theory and Practice, Equitable use of resources for sustainable life styles.

Watershed management, Cloud Seeding, Acid rain, Ozone layer depletion, Global warming, Population Growth and its Impact on environment, Green Revolution, Resettlement and Rehabilitation program, Mining and Dams and their conflictions, Environmental Impact Assessment.

UNIT – IV

Environmental acts: Water (Prevention and Control of pollution) act, Air (Prevention and Control of pollution) act, Environmental protection act, Wild life protection act, Forest Conservation act.

International Conventions: Stockholm Conference 1972, Earth Summit 1992 and Copenhagen Conference 2009.

Case Studies: Chipko movement, Narmada Bachao Andolan, Silent Valley Project, Madhura Refinery and Taj Mahal, Chernobyl Nuclear Diaster, Tehri Dam, Ralegaon Siddhi (Anne Hazare), Florosis and Bhopal Tragedy.

TEXT BOOK:

1. Environmental Studies by Benny Joseph, Tata McGraw-Hill Publishing Company Limited, New Delhi.

REFERENCE BOOKS:

1. Text Book of environmental studies, ErachBharucha, UGC.
2. Environmental Studies, AnubhaKaushik and C. P. Kaushik.
3. A basic course in environmental studies, S. Deswal and A. Deswal, DhanapathRai& Co.
4. Essentials of environmental studies, Kurian Joseph and R.Nagendram, Pearson Education Pt Ltd, Delhi.
5. Environmental studies, R.Rajagopalan, Oxford University Press.
6. Environmental Pollution Control Engineering, C. S. Rao, Wiley Eastern Ltd., New Age International Ltd.,
7. Introduction to Environmental Science, Anjaneyulu Y, B S Publications
8. Principles of Environmental Studies, Manoharachary C and Jayarama Reddy P, B S Publications.
9. Comprehensive environmental studies- OP Sharma, Laxmi Publications.
10. Environmental Studies- Thomson series-by G Tyler Miller,Jr.

ENGINEERING GRAPHICS

(Common to all branches)

EE 116/ME 01

Lectures	:	3 Periods/Week, Tutorial: 3	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

(18 Periods)

INTRODUCTION: Introduction to Drawing instruments and their uses, geometrical construction procedures. **2x3=6 Periods**

CURVES: Conic sections – general construction methods for ellipse, parabola and hyperbola. Other methods to construct ellipse only, cycloid, involute of a circle. **4x3=12 Periods**

UNIT – II

(18 Periods)

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

UNIT – III

(12 Periods)

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

UNIT – IV

(15 Periods)

PROJECTIONS OF SOLIDS: Projections of Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions.

UNIT – V

(21 Periods)

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. "Engineering Drawing", N.D. Bhatt & V.M. Panchal. (Charotar Publishing House, Anand). (First angle projection)

REFERENCE BOOK:

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

PHYSICS LAB – I

(Common to all branches)

CS 151/ PH L01

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

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.
3. Determination of thickness of thin wire using air wedge interference bands.
4. Determination of radius of curvature of a Plano convex lens by forming Newton's rings.
5. Determination of wavelengths of mercury spectrum using grating normal incidence method.
6. Determination of dispersive power of a given material of prism using prism minimum deviation method.
7. Draw the resonant characteristic curves of L.C.R. series circuit and calculate the resonant frequency.
8. Draw the characteristic curves of a photocell and calculate the maximum velocity of electron.
9. Verify the laws of transverse vibration of stretched string using sonometer.
10. Determination of numerical aperture of an optical fiber.

CHEMISTRY LAB – I

(*Common to all branches)*

EE152/CY L01

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

LIST OF EXPERIMENTS

1. Introduction to Chemistry Lab (the teachers are expected to teach fundamentals like Primary, Secondary Standard Solutions , Normality, Molarity, Molality etc and laboratory ware used, error ,accuracy, precision, Theory of indicators, use of volumetric titrations.

2. Volumetric Analysis:
    1. Estimation of acid content in un-known solution
    2. Estimation of Iron by Dichrometric method
    3. Estimation of Copper by Iodometric method
    4. Estimation of available chlorine in bleaching powder

3. ANALYSIS OF WATER: Estimation of :
    1. TOTAL HARDNESS BY EDTA METHOD
    2. TURBIDITY
    3. CONDUCTIVITY
    4. pH
    5. TOTAL DISSOLVED SALTS
    6. SALANITY
    7. ALKALINITY
    8. DISSOLVED OXYGEN

4. BACTERIAL COUNT: The student has to get his water sample and the teacher has to explain the analysis and the results are to be compared with the INDIAN STANDRDS.

5. CONSTRUCTION OF GALVANIC CELL: Based on the position of the metals in the electrochemical series a model electrochemical Cell is constructed and the values are determined and effect of metal ion concentration, Temperature etc. on emf are calculated.

TEXT BOOKS:

1. "Practical Engineering Chemistry", K. Mukkanti, etal, B.S. Publications, Hyderabad.
2. "Inorganic quantitative analysis", Vogel.

REFERENCE BOOKS:

1. "Text Book of engineering chemistry", R. N. Goyal and Harrmendra Goel.
2. "A text book on experiments and calculation Engg.", S.S. Dara.
3. "Instrumental methods of chemical analysis", Chatwal, Anand, Himalaya publications.

WORKSHOP

(Common to all branches)

ME L01

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

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

MATHEMATICS – II

(Common for all branches)
EE 121/MA02
I B.Tech. II Semester

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Fourier Series: Periodic Functions, Trigonometric Series, Fourier Series, Functions of Any Period P = 2L, Even and Odd Functions, Half Range Expansions, Complex Fourier Series, Approximation by Trigonometric polynomials.

UNIT – II

Laplace Transforms: Laplace Transform, Inverse Transform, Linearity, Shifting, Transforms of Derivatives and Integrals, Differential Equations, Unit Step Function, Second Shifting Theorem, Dirac's Delta Function, Convolution theorem (without proof).

UNIT – III

Integral Calculus: Evaluation of double integrals (Cartesian & Polar), Changing the order of integration, Evaluation of triple integrals, Applications of triple integrals to find area and volume.

UNIT – IV

Vector calculus: Scalar and vector point functions, Gradient of a scalar field, Directional derivative, Divergence of a vector field, curl of a vector field, Line integrals, Line integrals independent of path, Green's theorem in the plane (without proof), Surface integrals, Triple integrals, Divergence theorem of Gauss (without proof), Applications to Engineering problems, Stokes theorem(without proof).

TEXT BOOK:

1. "Advanced Engineering Mathematics", Erwin Kreyszig, 8th edition, John Wiley & Sons.

REFERENCE BOOKS:

1. "Advanced Engineering Mathematics", Peter V. O'Neil, Thomsons Brooks/Cole.
2. "Advanced Calculus", Murray R Spiegel, Schaum's outline series.

ENGINEERING PHYSICS – II

(Common to all branches)

EE 122/ PH02

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT - I

Electron theory of solids & semiconductor physics (10 periods)

Electron theory of solids: Failure of classical free electron theory, quantum free electron theory, Fermi-Dirac distribution and its temperature dependence, Kronig-Penny model (Qualitative), effective mass of electron, concept of hole.

Semiconductor physics: Classification of semiconductors, P-N junction diode and its characteristics, carrier concentration in P and N type semiconductors, Equation of continuity.

UNIT – II

Magnetic, Dielectric and Ferro-electric materials (10 periods)

Origin of magnetic moment of an atom, Bohr magneton, Weiss theory of Ferro magnetism (Qualitative), Hysteresis curve, soft and hard magnetic materials, ferrites and its applications.

Dielectric materials, Types of polarizations, internal field (qualitative), Classius – Mossetti equation, Frequency dependence of polarization, Ferroelectrics and its applications.

UNIT – III

Advanced materials (12 periods)

Nano-materials: Introduction to nano-materials, Fabrication of nano-materials and carbon nano tubes (CVD and sol-gel), physical and chemical properties of nano materials, Applications of nano materials (Structural point, Storage of information, Strength point)

Superconductivity: Meissner effect, types of superconductors, elements of BCS theory, Applications of superconductors.

Opto-electronic devices: Working and applications of solar cell, LED, LCD, Photo Diode.

UNIT – IV

Analytical techniques (10 periods)

Nuclear techniques: Radio isotopes and its applications (Medical and Industrial), GM-counter, scintillation counter.

Ultrasonics: Properties of ultrasonics, General applications of ultrasonics.

Medical applications: Cardiology, Neurology, Ultrasonic imaging.

NDT: Pulse echo technique, cavitation effect, Time of flight diffraction technique.

Structure determination: Crystal planes, Bragg's law, structural analysis of crystal using X-Ray powder diffraction method.

TEXT BOOKS:

1. "Engineering physics", M.R.Sreenivasan, Newage International Publication.
2. "Engineering Physics", Palani swamy, Scitech Pulishers.
3. "Solid State Physics", Dekkar.

REFERENCE BOOKS:

1. "Material Science for scientists and Engineers", Srinivasan & Srivastava, TMH Publishers.
2. "A text book of engineering physics", M.N.Avadhanulu & P. Krushisagar, S.Chand Pub.
3. "Material Science", Vijaya Rangarajan.

ENGINEERING CHEMISTRY – II

(Common to all branches)

EE 123/CY02

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I **(11 Periods)**

ELECTROCHEMISTRY

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance –potentiometer titrations (redox - Fe^{2+} vs dichromate and precipitation – Ag^{+} vs Cl^{-}titrations) and conduct metric titrations (acid-base – HCI vs, NaOH) titrations.

UNIT – II

(11 Periods)

CORROSION AND CORROSION CONTROL

Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

GREEN CHEMISTRY: Introduction-concepts-Engineering Applications.

UNIT – III

(12 Periods)

LIQUID AND GASEOUS FUELS AND COMBUSTION: Petroleum based: Petroleum processing and fractions – cracking – catalytic cracking and methods-knocking and anti-knocking Agents – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes.

Gaseous fuels- water gas, producer gas, CNG and LPG, Flue gas analysis – Orsat apparatus – theoretical air for combustion.

PHASE RULE AND ALLOYS: Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

UNIT – IV

(11 periods)

ANALYTICAL TECHNIQUES: Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy –principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) –estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy

.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P.C.Jain, Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S.Dara, Mukkanti K.,"A text book of Engineering Chemistry", S.Chand & Co., Ltd., New Delhi (2006).
3. B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).

REFERENCE BOOKS:

1. B.K.Sharma, "Engineering Chemistry", Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. "Enginering Chemistry", J.C.Kuriacase & J.Rajaram, Tata McGraw Hill, New Delhi (2004).
3. "Chemistry of Engineering Materials", R.P Mani, K.N.Mishra, CENGAGE learning.
4. "Applied Chemistry - A text for Engineering & Technology", – Springar (2005).
5. "Text Book of Engineering Chemistry", Shasi Chawla, Dhantpat Rai Publishing Company, NewDelhi (2008).
6. "Engineering Chemistry", R. Gopalan, D. Venkatappayya, D.V. Sulochana Nagarajan, Vikas Publishers (2008).

BASIC ELECTRICAL SCIENCE
EE 124

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

DC Circuits: Resistance-ohms law-Kirchho's Laws-Superposition Theorem-Thevenin's Theorem-delta-star and star-delta transformations.

AC Circuits: Generation of alternating e.m.f-average and r.m.s values of sinusoidal signal-representation of an alternating quantity by a phasor ,Circuits with R, L and C in series and in parallel-The 'j' operator-resistance, reactance and impedance-conductance, susceptance and admittance-active and reactive power-relationships between line and phase quantities of Three-phase star and delta connected systems.

UNIT – II

Magnetic Circuits: Magnetic field- magnetic flux- magnetic flux density- permeability-relative permeability-magnetic field intensity – magneto motive force- reluctance, ohms law for magnetic circuits, comparison between Magnetic & Electric circuits ,Leakage and fringing in magnetic circuits, simple series and parallel magnetic circuits.

UNIT – III

DC Machines: DC Generator- Principle of operation – types – emf equation –characteristics, DC motor – principle of operation – types – torque equation.

AC Machines: Transformer- Principle of action - emf equation- no load phasor diagram – equivalent circuit ,3-phase induction motor – principle of action – torque- slip characteristics, Synchronous generator- construction of salient pole and cylindrical rotor- emf equation, Synchronous motor- principle of action.

UNIT – IV

Electrical Measurements: Control and damping – moving – coil , moving – iron ammeters and voltmeters – electro dynamic watt meter – cathode ray oscilloscope.

TEXT BOOKS:

1. Electrical technology by Edward hughes language book society/longman.
2. Basic Electrical Engineering by Mittal, Tata McGraw- Hill

REFERENCE BOOKS:

1. H Cotton, Advanced Electrical Technology,AH Wheeler & Co., 1990.
2. Electrical technology by William Walton laurie horwood, C.griffen & company ltd.
3. Electrical circuit theory and technology by john bird newness publications.
4. Vincent Del Toro, Fundamentals of Electrical Engineering, Pearson Education.

ENGINEERING MECHANICS
EE 125/CE 01

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

General Principles: Mechanics, Fundamental concepts, Units of measurements, International
systems of units, Numerical calculations, General procedure for analysis.
Force Vectors: Scalars and vectors, Vector operations, Vector addition of forces, Addition of a
system of coplanar forces.
Equilibrium of a Particle: Condition for equilibrium of a particle, The free body diagram, Coplanar force system.
Force System Resultants: Moment of a force (Scalar formation), Principle of moments, Moment of a couple (Scalar formation), and Equivalent system, Resultants of a force and couple system (Coplanar force system), further reduction of a force and couple system (Coplanar force system).
Equilibrium of a Rigid Body: Conditions for rigid body equilibrium (Equilibrium in two dimensions), Free body diagrams, Equations of equilibrium, Two and three force members.

UNIT – II
Friction: Characteristics of dry friction, Problems involving dry friction.
Center of Gravity and Centroid: Center of gravity and center of mass for system of particles,
Center of gravity, center of mass and centroids for a body, Composite bodies.
Moments of Inertia: Definition of moments of inertia for areas, Parallel axis theorem for area,
radius of gyration of an area, Moments of inertia of an area by integration, Moments of inertia for composite areas.

UNIT – III
Kinematics of a Particle: Introduction, Rectilinear kinematics: Continuous motion, General curvilinear motion, Curvilinear motion: Rectangular components, Motion of a projectile, Curvilinear motion: Normal and tangential components, Absolute dependent motion analysis of
two particles.
Kinetics of a Particle: Force and Acceleration: Newton's law of motion, The equation of motion, Equation of motion for a system of particles, Equation of motion: Rectangular coordinates, Equation of motion: Normal and tangential coordinates.

UNIT – IV
Kinetics of Particle: Work and Energy: The work of a force, Principle of work and energy, Principle of work and energy for a system of particles, Power and efficiency, Conservative forces and potential energy, Conservation of energy.
Kinetics of Particle: Impulse and Momentum: Principle of linear impulse and momentum, Principle of linear impulse and momentum for a system of particles, Conservation of linear momentum for a system of particles, Impact

TEXT BOOKS:

1. Engineering Mechanics. Statics and Dynamics by R.C. Hibbeler and Ashok Gupta. Pearson Education.

REFERENCE BOOKS:

1. Vector mechanics for Engineers. Statics and Dynamics by Beer and Johnston, Tata Mc Graw-Hill publishing company, New Delhi.
2. Engineering Mechanics by S. Timoshenko and D. H. Young – Mc Graw-Hill International Edition.
3. Engineering Mechanics. Statics and Dynamics by J. L. Meriam and L. Kraige
4. Engineering Mechanics for Engineers. Statics and Dynamics by Beer and Irving H. Shames, Pearson Education.

COMPUTER PROGRAMMING WITH C

(Common to all Branches)

EE 126/ CS01

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Introduction:

Computer Fundamentals: Computer and it's components, hardware/software**,** algorithm, characteristics of algorithms, flowchart, symbols used in flowchart, history of C, basic structure of a C program.

C Tokens: Character set, variables, keywords, data types and sizes, type qualifiers, numeric constants and their forms of representation, character constants, string constants, declaration and initialization of variables.

Operators & Expressions: Arithmetic operators and expressions, type-conversion rules, coercion, assignment operators and expressions, increment and decrement operators, conditional operator, statements, preprocessor directives, input/ output functions and other library functions. Relational operators and expressions, Boolean operators and expressions, operator precedence and associatively.

Control Statements: if-else statement, else-lf statement and switch statement.

Programming Exercises for Unit I :

C-expressions for algebraic expressions, evaluation of arithmetic and Boolean expressions. Syntactic errors in a given program, output of a given program, values of variables at the end of execution of a program fragment, filling the blanks in *a* given program. 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, computation of electricity bill and conversion of lower case character to its upper case.

UNIT – II

Control Statements: while loop, for loop, do while loop, nested Control statements, break and continue statements.

Arrays: One-Dimensional numeric and character arrays and Two-Dimensional numeric and character arrays.

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 and computation of statistical parameters of a given list of 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. Transpose of a matrix, product and sum of matrices and sorting of names using arrays.

UNIT – III

Functions: Function definition, parameter passing mechanisms and simple recursion.
Scope & extent: Scope rules and storage classes.
Pointers and Dynamic Memory Allocation: Pointer variables**,** pointer arithmetic, dynamic memory allocation, array of pointers, command line arguments, passing pointer variables as parameters to functions.

Programming Exercises for Unit - III:
Functions - Insertion sort, Linear search. Recursive functions to find factorial & GCD(Greatest Common Divisor), string operations using pointers and pointer arithmetic and dynamic memory allocation. Swapping two variable values. Sorting a list of names using array of pointers and command line arguments.

UNIT – IV

Structures: Structures, array of structures, pointers to structures, unions and difference between structure and union.
Files: File handling functions for input and output.

Programming Exercises for Unit - IV:

Operations on complex numbers, matrix operations with the matrix and the size of the matrix as a structure, sorting a list of student records on register number using array of pointers and to read an input file of marks and generate a result file.

TEXT BOOK:

1. Byron Gottfried, “Programming with C”, Schaum's Outline series.

REFERENCE BOOKS:

1. Kernighan BW and Dennis Ritchie M, “C programming language”, 2nd ed, Prentice Hall.
2. Yashavant P. Kanetkar, “Let us C”, BPB Publications.
3. E.Balagurusamy, “Programming in ANSI C”, 4th ed, Tata Mc graw-Hill.
4. Herbert Schildt, “C: The Complete Reference”, 4th edition, Tata Mc graw-Hill.

PHYSICS &CHEISTRY LABORATORY – II

(Common to all branches)

EE 161/ PHCY L01

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

(A Selected list of Experiments from the following)

PHYSICS LAB-II

1. Determine the rigidity modulus of the given material of the wire using Torsionalpendulum.
2. Determination of room temperature using platinum resistant thermometer.
3. Draw the load characteristic curves of a solar cell.
4. Determination of Hall coefficient of a semiconductor.
5. Determination of velocity of ultrasonic wave in a given liquid using ultrasonic interferometer.
6. Draw the characteristic curves of a G.M. counter and calculate the best operating voltage.
7. Determination of voltage and frequency of an A.C. signal using C.R.O.
8. Draw the I/V characteristic curves of a P-N junction diode.
9. Determination of Forbidden energy gap of Si &Ge.
10. Determination of wavelength of laser source using Diode laser.

CHEMISTRY LAB – II

1. **PRODUCTION OF BIODIESEL**: The teacher has to perform the transesterfication reaction of FATTY ACID and the Biodiesel thus produced can be used for analysis.

2. **ESTIMATION OF PROPERTIES OF OIL:**
   a. Acid Number
   b. Viscosity
   c. Saponification value
   d. Aniline point
   e. Flash and Fire points
   f. Pour and Cloud point.

3. **PREPARATION OF**:
   a. PHENOL –FORMALDEHYDE RESIN
   b. ASPIRIN
   c. Phenylbenzoate
   d. Soap

4. **SOIL ANALYSIS**: pH, Determination of Zinc, Iron and Copper.

5. **Kinetics:** To determine the rate constant of hydrolysis of methyl acetate catalyzed by an acid and also the energy of activation. (or) To study the kinetics of reaction between $K_2S_2O_8$ and KI.

6. **Demonstration Experiments (Any two of the following) :**
    a. Determination of dissociation constant of weak acid-by pH metry
    b. Preparation of Thiokol rubber
    c. Adsorption on Charcoal
    d. Heat of reaction
7. **FOOD ANALYSIS:** Determination Saturated and Unsaturated Fatty Acids, pH,etc.

TEXT BOOKS:

1. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
2. Vogels Text Book of Quantitative Chemical Analysis 6th Edition (2002).

REFERENCE BOOKS:

1. Text Book of engineering chemistry by R. N. Goyal and HarrmendraGoel.
2. A text book on experiments and calculation Engg. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications, 5th edition
2004

ENGLISH LANGUAGE LAB

(Common to all branches)

EE 162/EN L01

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

OBJECTIVES

This course enables the students to expedite the process of improving communication in both formal and in formal situation. A special attention has been paid to the needs of competitive and current demands.

Introduction to communication: Difference between communication and communication skills, Types of communication, Barriers to communication.

Introduction to skills: Listening skills, writing skills, Reading skills, and Speaking skills.

Pronunciation drills: Phonetics, British English and American English.

Conversational skills: Dialogue, Telephonic Interaction.

Professional writings & skills: Resumes, Reports, Business letters and Interview skills.

Practical: Extempore Debates, Group discussion, and Oral presentation.

RECOMMENDED SOFTWARES:

Digital Language Lab - Networking Software.
HiClass – Software.

English Language – Listening, Speaking Reading, Writing Skills:

A lania series – English Mastery, Levels A, B (Set of 2 CDs).
English Discoveries (Set 0f 12 CDs).

English Grammar / Pronunciation:

Live Action English Interactive
Speech Solutions

Dictionaries

Cambridge Advanced Learner's
Oxford Genie & Advanced

Writing

Easy writer
Creative writing

Professional English

Telephonic English
English in mind

English for ETS

Barron's
TOFFL Mastery
IELTS

GRE

COMPUTER PROGRAMMING LAB

(Common to all Branches)

EE 163/ CS L01

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

LIST OF PROGRAMS

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

Domestic level Consumption As follows:	
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 – 50	0.50 per unit
100 – 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):
   1. $1 + x^2/2! + x^4 / 4!+$ …upto ten terms
   2. $x + x^3/3! + x^5/5!+$ … upto 7 digit accuracy
3. Write a C program to check whether the given number is prime or not.
4. Write a C program to display statistical parameters (using one – dimensional array).
   1. Mean
   2. Mode
   3. Median
   4. Variance.

NOTE: Use functions for each subtask in the following programs

5. Write a C program to read two matrices and compute their sum and product.
6. A menu driven program with options (using array of character pointers).
   1. To insert a student name
   2. To delete a name
   3. To sort names in alphabetical order
   4. To print list of names

7. 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

8. 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.
9. Write a C program to read a data file of student’s records with fields(Regno, Name, M1,M2,M3,M4,M5) and write the successful students data (percentage > 40%) to a data file.

MATHEMATICS – III

(CE/CH/CS/EC/EEE/EI/IT/ME)

EE211 / MA 03

II B.Tech. I Semester

Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I (16 Periods)

Fourier integrals: From Fourier series to the Fourier integral, Application of the Fourier integral, Fourier Cosine and Sine integral, Evaluation of integrals, Fourier cosine and sine Transforms: Fourier Cosine Transforms, Fourier Sine Transforms, Linearity, Transforms of Derivatives, Fourier Transform: Complex form of the Fourier integral, Fourier Transform and its inverse, Linearity. Fourier Transform of Derivatives, Convolution.

UNIT – II (16 Periods)

Partial differential equations: Basic concepts, Modeling-Vibrating string, Wave Equation Separation of Variables Use of Fourier series, D'Alembert's Solution of the Wave Equation, Heat Equation-Solution Fourier series, Steady-State Two-Dimensional Heat Flow

UNIT – III (16 Periods)

Numerical Methods in general: Introduction, Solution of Equations by Iteration, newton's Method for Solving Equations f(x) = 0, Convergence of Newton's method, Interpolation: Lagrange interpolation, Newton's divided difference interpolation, Equal spacing: Newton's forward Difference formula, Newton's Backward Difference formula, Inverse interpolation, Numerical integration and Differentiation: Trapezoidal Rule, Error Bounds and Estimate for the Trapezoidal Rule, Simpson's Rule of integration, Error of Simpson's rule.

UNIT – IV (16 Periods)

Numerical methods in linear algebra: Linear Systems: Gauss Elimination, LU Factorization, Gauss-Seidel iteration Method, Method of least Squares, Methods of First order Differential Equations: Euler's method, Runge-Kutta methods, Methods for Elliptic Partial Differential Equations: Laplace equation, Poisson equation

TEXT BOOK:

1. "Advanced Engineering Mathematics", Erwin Kreyszig, 8th edition, John Wiley & Sons.

REFERENCE BOOKS:

1. "Advanced Engineering Mathematics", Peter V. O'Neil, Thomsons Brooks/Cole.

EE 212 CIRCUIT THEORY-I

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

INTRODUCTION OF CIRCUIT ELEMENTS: Basic definition of the unit of Charge, Voltage, Current, Power and Energy, Circuit concept, Active and Passive circuit elements; Ideal, Practical and dependent sources and their V-I characteristics, Source transformation, Voltage and Current division; V-I characteristics of Passive elements and their series / parallel combination; Star Delta transformation, Energy stored in Inductors and Capacitors Kirchhoff's Voltage law and Kirchhoff's Current law.

UNIT – II

NETWORK THEOREMS: Superposition theorem, Thevenin's and Norton's theorems, Reciprocity, Compensation, Maximum power transfer theorems, Tellegan's and Millman's theorems, Application of theorems to DC circuits. **ALTERNATING CURRENTS AND VOLTAGES:** 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.

UNIT – III

SINUSOIDAL STEADY STATE ANALYSIS: Application of network theorems to AC circuits. Computation of active, reactive and complex powers; power triangle, power factor. **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.

UNIT – IV

TRANSIENTS AND LAPLACE TRANSFORMS: Steady state and transient response, DC and Sinusoidal response of an R-L, R-C, R-L-C circuits. Laplace Transforms of typical signals, periodic functions, Inverse transforms, Initial and final value theorems, Application of Laplace transforms in circuit analysis.

TEXT BOOKS:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, Engineering Circuit Analysis, 6th Edition,TMH, 2002.
2. A Sudhakar and Shyam Mohan SP, Circuits and Networks: Analysis and Synthesis, 3rd Edition, TMH, 2006.

REFERENCE BOOKS:

1. Franklin F.Kuo, Network Analysis and Synthesis, 2nd Edition, John Wiley & Sons, 2003
2. M.E.Vanvalkenburg, Network Analysis, 3rd Edition, PHI, 2003.
3. Circuit theory analysis and synthesis by Dr Abhijit chakrabarti, Dhanapatrai&co(p) Ltd.

EE213 / EC02 ELECTRONIC DEVICES

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

TRANSPORT PHENOMENA IN SEMICONDUCTORS: Insulators, semiconductors, and metals, Mobility and Conductivity, Electrons and holes in an Intrinsic semiconductor, Donor and Acceptor impurities, charge densities in a semiconductor, Electrical properties of Ge and Si, Hall Effect, Conductivity modulation, Generation and Recombination of charges, Diffusion, Continuity equation, Injected -minority carrier charge, Potential Variation within a Graded Semiconductor.

UNIT – II

JUNCTION DIODE CHARACTERISTICS: Open-circuited P-N Junction, P-N Junction as a Rectifier, Current Components in a p-n diode, The volt-ampere characteristic temperature Dependence of the V/I characteristic, Diode Resistance, Space-charge, or Transition, capacitance $C_{T,}$ Charge- control Description of a Diode, Diffusion Capacitance, Breakdown Diodes, Tunnel Diode, Photo Diode, LED Characteristics and areas of applications.

UNIT – III

BIPOLAR JUNCTION TRANSISTOR: NPN & PNP junction transistors, Transistor current components, Transistor as an Amplifier, CB Configuration, CE Configurations ,CE Cutoff& Saturation Regions, Typical Transistor- Junction Voltage Values, CE Current Gain, CC Configuration, Maximum Voltage Rating, Operating point, Bias Stability, Self-bias, or Emitter bias, Stabilization Against Variation in I_{CO},$V_{BE,}$ and β, Bias Compensation Thermistor and Sensistor Compensation, Thermal Runaway, Thermal Stability

UNIT – IV

FIELD EFFECT TRANSISTER: JFET, Pinch-off Voltage V_P, volt-ampere characteristics, Depletion-MOSFET, Enhancement-MOSFET, Biasing the FET.

PNPN AND OTHER DEVICES: SCR, DIAC, TRIAC, UJT, and The Phototransistor (their characteristics only).

TEXT BOOKS:

1. Jacob Millman and Christos C Halkias, Integrated Electronics Analog and Digital Circuits and Systems,2_{nd} Edition,TMH, 2002

2. Robert L Boylested and Louis Nashelsky , Electronic Devices and Circuit Theory, 8th Edition, PHI, 2003

REFERENCE BOOKS:

1. Theodore F Bogart Jr., Jeffrey S Beasley and Guillermo Rico, Electronic Devices and Circuits, 6th Edition, Pearson Education, 2004.

2. David A Bell, Electronic Devices and Circuits, 4th Edition, PHI, 2003

3. NN Bhargava, DC Kulshrestha and SC Gupta – Basic Electronics and Linear Circuits, TTTI Series, TMH, 2003.

PRIME MOVERS & PUMPS
EE214/ME04

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Unit-I

Properties of Fluids: Definition - Mass Density - specific weight -specific volume - Relative Density- pressure.

Impact of Jets: Force of jet impinging normally on a stationary and moving plate - series of moving vanes - Fixed curved vane – moving curve dvane. Centrifugal Pumps**:** Principle of operation - types of casings - work done by a centrifugal pump – priming - Manometric head - Efficiencies of centrifugal pumps - specific speed.

Unit-II

Hydraulic Turbines: Impulse Turbines: Principle of operation of Pelton wheel - work done by an impulse turbine - Power produced by an impulse turbine - Efficiencies of turbine - Design of pelton wheel.**Reaction Turbine:** Principle of operation - classification of reaction turbines - Main components of a reaction turbine - power produced by a reaction turbine - Francis turbine - Kaplan turbine - Draft tube- cavitation - specific speed.

Unit-III

Basic Thermodynamics: Fundamental concepts and definitions - Thermodynamic systems - zeroth law – work done in constant pressure, constant volume, constant temperature processes only.

First Law of Thermodynamics**:** Internal Energy – Enthalpy - Cv – Cp –Steady flow energy equation. Second law of thermodynamics**:** Statements of second law - Reversible process Carnot cycle – operation (**Power cycle:** Rankine cycle - Otto cycle - Diesel cycle - Brayton cycle – efficiencies.

Unit-IV

IC Engines: Classification of IC Engines - principles of SI & CI engines – comparison of 2 stroke & 4 stroke engine and SI & CI engines.Steam Turbines**:** Types of steam turbines – Impulse turbines - principle of operation - compounding - Power - blade efficiency & Stage efficiency. Gas Turbines**:** Closed cycle gas turbines – thermal efficiency and work output – improvements to ideal cycle using inter cooling, reheat and regeneration.

TEXT BOOKS:

1. A Treatise on Heat Engineering by Vasandani & Kumar

2. Fluid Mechanics & Hydraulic Machines by P.N. Modi & Seth

3. Thermal Engineering by R.K. Rajput

REFERENCE BOOKS:

1. Fluid Mechanics and Hydraulic Machines by Dr. R.K. Bansal

2. Thermal science and Engineering by D.S. Kumar Kataria & Sons

DIGITAL ELECTRONICS

EE215/ EC03

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Number systems and codes:
Decimal, Binary, Octal, Hexadecimal Number systems and their conversions, Arithmetic additions, subtraction using the method of complements, Multiplication and division in different number systems. Representation of binary numbers in sign magnitude, ones complement and 2's complement form. Subtraction using the method of complements.
Codes: Introduction, binary codes, BCD codes, 8421 codes, Excess 3 code, Gray code, Alphanumeric and Error detection and correction using Hamming code.
Boolean algebra: Introduction, Boolean postulates and theorems, Boolean functions and expressions, canonical and standard forms of Boolean functions, Logic gates, Universal gates, realization of Boolean functions using basic gates and universal gates.,

UNIT – II

Simplification of Boolean Expressions:
Simplification of Boolean functions using K maps (up to five variables), QuineMccluskey minimization technique (Tabulation method).
Combinational logic circuits: General design procedure for Combinational logic circuits, Design and applications of Binary Adders and Subtractors, Comparators, Encoders, Decoders, Multiplexers and Demultiplexers, Design of BCD to 7 Segment Decoder, Parity Generator and Checker, Error Detection and Correction using Hamming Code, BCD Adder / Subtractor Carry look ahead adders.

UNIT – III

Sequential logic circuits: Flip – Flops : SR Flip Flop, JK Flip Flop, T Flip Flop, D Flip Flop. Characteristic Table, Characteristic Equation, Excitation table for SR, JK, D and T Flip Flops. Level triggering, Edge triggering, and master Slave JK Flip - Flop. Conversion from one type of flip – Flop to another. Analysis and synthesis of sequential circuits.
Counters And Registers: Modulous of counter, design of Ripple counters: Up counter, down counter, BCD counter, Up/Down counter using Flip – Flops. Design of Synchronous counters, Sequence Generator Registers: Definition, Data movement in registers, registers based on data movement. Shift registers: Shift left register, shift right register, Bidirectional shift registe, rign and Jhonson counters.

UNIT – IV

IC LOGIC FAMILIES: RTL, DTL, TTL, ECL, MOS, CMOS and IIL families and their comparison. MSI and LSI: Programmable Logic Arrays, Programmable Array Logic.

TEXT BOOKS:

1. M Morris Mano, Digital Logic and Computer Design, PHI/Pearson Education, 2003.
2. RP Jain, Modern Digital Electronics, 3rd Edition, TMH, 2003
3. Fundamental of Digital Circuits, A.Anand Kumar, Pearson Education, 4th Edition

REFERENCE BOOKS:

1. Zvi Kohavi, Switching and Finite Automata Theory, 2nd Edition, TMH, 1978
2. Taub and Schilling, Digital Integrated Electronics, Mc-Graw Hill, 1977.

EE-216 ELECTRO MECHANICS – I

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Unit – I

Magnetic Circuits:

Introduction - simple magnetic circuit – magnetic circuits with air gap – Air-gap fringing fields – Magnetic equivalent circuit – properties of magnetic materials – Hysteresis and eddy current losses – permanent magnetic materials. Electro Mechanical Energy Conversions:

Energy in Magnetic system - field Energy and mechanical force - mechanical energy. Torques in systems with permanent magnets

Unit – II

D.C. Machines:

Principles - constructional features - operation of DC generators and motors. Types of Windings – lap and wave. Armature reaction and compensations - commutation and interpoles. No load and load characteristics of all types of DC generators and their applications

Unit-III

Parallel operation of D.C. generators - characteristics of DC Motors - applications - DC motor starters and their design - speed control of DC shunt series and compound motors

Unit – IV

Losses efficiency and testing of DC machines - Swinburne's - Hopkinson's - retardation - Field Test etc.,

TEXT BOOKS:

1. Electric Machinery by P.S. Bhimbra, Khanna Publications 7th edition
2. Electric Machinary-A.E. Fritzgerald, C. Kingsley &S. Umans, Mc Graw-Hill Companies, 6th editon 2003.

REFERENCE BOOKS:

1. Performance and Design of D.C Machines – by Clayton & Hancock, BPB Publishers.
2. Theory & performance of Electric Machines, by J. B. Gupta, S.K. Kataria & Sons
3. Electro mechanics – I (D.C. Machines) S. Kamakshaiah Right Publishers.
4. Electric Machines by I.J. Nagrath & D.P. Kothari, Tata Mc Graw – Hill Publishers, 3rd edition, 2004.

EE 251 ELECTROMECHANICS LAB-I

Lectures	:	3 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

LIST OF EXPERIMENTS:

1. Verification of Kirchoff's Laws

2. Verification of Thevenin's Theorem

3. Verification of Superposition Theorem

4.Verification of Maximum power transfer theorem and reciprocity theorem

5. Parameters of a given Choke Coil

6. Locus Diagrams of R-C and R-L circuits

7.Open circuit characteristics of separately excited / self excited D.C shunt generator

8. Load test on D.C Shunt Generator

9. Load test on D.C Compound Generator

10. Load test on D.C series generator

11. Swinburne's Test

12. Speed control of DC shunt motor

13. Brake test on D.C Shunt Motor

14. Hopkinson's test on D.C Machines

15. Retardation test on D.C. Machine

16. Resonance of series and parallel R-L-C circuits

Note: Minimum 10 experiments should be conducted.

EE 252 /ECL05 ELECTRONICS LAB – I

Lectures	:	3 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

LIST OF EXPERIMENTS:

1. Characteristics of PN Junction and Zener diode
2. Characteristics of Transistor in Common Emitter configuration
3. Verification of Transistor Self Bias Circuit
4. Characteristics of Junction Field Effect Transistor
5. Characteristics of Uni junction Transistor
6. Characteristics of Silicon Controlled Rectifier
7. Realisation of Gates using Discrete Components and Universal Building Block
8. Design of Combinational Logic Circuits like half-adder, Half-subtractor and Full-subtractor
9. Design of Code converters, Multiplexers & Decoders
10. Verification of Truth Tables of Flip Flops using Gates
11. Design of Shift Register, Ring Counter and Johnson Counter using Flip Flops
12. Design of Asynchronous counter, Mod counter, Up counter, Down counter and Up/Down counter using Flip Flops
13. Design of Synchronous Counter, Mod Counter, Up counter, Down counter and Up/Down counter using Flip Flops.
14. Design of Sequence Generators using shift Registers and Multiplexers

Note: Minimum 10 experiments should be conducted.

EE 253 ELECTRICAL WORKSHOPS

Lectures	:	3 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

LIST OF EXPERIMENTS:

1. Assembling and Testing of ceiling fan

2. Assembling and Testing of various components and wiring of fluorescent lamp

3. Assembling and Testing of Blender

4. Study of various meters sand their connections (Ammeter, Voltmeter, Wattmeter, Energy meter).

5. Assembling and Testing of D.C Compound generator.

6 Assembling and testing of 1-phase transformer

7. Assembling and Testing of PMDC motor

8. Assembling and Testing of Personal Computer

9 .Assembling and Testing of A.C Regulator

10. Design and testing of 1-phase Rectifier

11. Detection of hotspot in electrical system by using Thermal Image Camera

12. Assembling and Testing of DOL starter

13. Assembling and Testing of Star-Delta starter

14. Design and Estimation of Industrial wiring

15. Checking of build up of the voltage of D.C shunt generator

Note: Minimum 10 experiments should be conducted.

Mathematics – IV

(ECE/EEE/EIE/ME)
EE221 / MA 04
II B. Tech - II Semester

Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Complex numbers and functions, conformal mapping:
Introduction to Complex Numbers, Derivative. Analytic Function, Cauchy's- Riemann equations. Laplace equation.
Geometry of analytic functions: conformal mapping, linear fractional transformations

UNIT – II

Complex Integration:
Line integral in the complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivates of analytic functions.

Unit – III

Taylor , Laurent series and Residue Integration
Taylor Series and Maclaurin series, Laurent Series, singularities and zeros. Infinity, Residue integration method, evaluation of Real Integrals.

UNIT – IV

Special Functions
Power Series method, Legendre's equation, Legendre Polynomials $P_n(x)$, Bessel's equation. Bessel functions $J_v(x)$.

TEXT BOOK:

1. "Advanced Engineering Mathematics", Erwin Kreyszig, 8th Edition, John Wiley, 2000.

REFERENCE BOOK:

1. "Theory and Problems of Complex Variables", Murray R Spiegel, Schaum's outline series.

EE222 / EC05 ELECTRONIC CIRCUITS – I

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

TRANSISTOR & FET AT LOW FREQUENCY:

Graphical analysis of the CE Configuration, Two-port Devices and the Hybrid model, Transistor Hybrid model, Determination of h parameters from Characteristics, Measurement of h parameters, Analysis of transistor amplifier using h Parameter model, Emitter Follower, Millers theorem and its Dual, cascading transistor amplifiers, Simplified CE&CC Hybrid models, High input resistance circuits – Darlington pair, Boot Strapped Darlington pair, Cascode transistor amplifier, FET small signal model, CS / CD / CG configurations at low frequencies

UNIT – II

POWER AMPLIFIERS:

Class A Large-signal amplifier ,Second-harmonic Distortion, Higher-order Harmonic Distortion, Transformer Coupled Audio Power Amplifier,Efficiency,Push-Pull Amplifiers Class B Amplifier ,Class AB Operation.

UNIT – III

FEEDBACK AMPLIFIERS:

Classification of amplifiers, Feedback concept, Transfer Gain with Feedback, Negative feedback amplifiers and their characteristics, Input &Output resistance, Method of Analysis of a feedback amplifier, Voltage-series Feedback, Voltage-series Feedback pair, Current-series Feedback, Current- shunt Feedback ,Voltage-shunt Feedback.

UNIT – IV

OSCILLATORS:

Barkhausen criterion for sinusoidal oscillators, RC phase shift oscillator using FET and BJT, Resonant circuit oscillators, General Form of Oscillator, Wien Bridge, Hartley, Colpitt's oscillators using BJT, Crystal oscillators, Frequency stability criterion for oscillators.

RECTIFIERS:

Diode as a Rectifier, Half wave, Full wave and Bridge Rectifiers without filter and with inductor filter, Capacitor filter, L section and π- section filters.

TEXT BOOKS:

1. Jacob Millman and Christos C Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, TMH, 2003.

2. A.P.Godse, U.A.Bakshi, Electronic Devices and Circuits , 2nd Edition, Technical publications, Pune, 2008.

REFERENCE BOOK:

1. Donald L. Schilling and Charles Belove, Electronic Circuits-Discrete and Integrated, 3rd Edition, TMH, 2002.

2. Theodore F Bogart Jr., Jeffrey S Beasley and Guillermo Rico, Electronic Devices and Circuits, 6th Edition, Pearson Education, 2004.

3. Adel S. Sedra and Kenneth C.Smith, Microelectronic Circuits, 5th Edition, Oxford University Press, 2004.

4. NN Bhargava, DC Kulshrestha and SC Gupta – Basic Electronics and Linear Circuits, TTTI Series, TMH, 2003.

EE 223 / IT01 Object Oriented Programming & Operating System

Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

PRINCIPLES OF OBJECT ORIENTED PROGRAMMING: Concepts, benefits of OOPS, Object oriented Languages, Applications of OOP, Introduction to C++, C++ Statements, Creating the source file, Compiling and linking.**TOKENS, EXPRESSIONS AND CONTROL STRUCTURES:** Introduction, Tokens, Keywords, Basic Data Types, User defined data types, Derived data types, Declaration of variables, Operators in C++, Types, Scope resolution operator, Member dereferencing operator, Memory management operator, Type cast operator.

UNIT – IIFUNCTIONS: Main function, Function prototyping, Call by reference, Return by reference, Inline function, Function Overloading, Friend and Virtual functions.**CLASSES AND OBJECTS:** Specifying a class, Defining member functions, Memory allocation for objects, Friendly functions, Pointer to members.**CONSTRUCTORS AND DESTRUCTORS** – Introduction

UNIT – III

OVERVIEW OF OPERATING SYSTEMS: Introduction, Computer systems structures, Operating system structures**PROCESS MANAGEMENT:** Process: Process Concepts, Process Scheduling, Operation on Process, Co-operating Process, Threads, Inter process communication.**CPU SCHEDULING:** Scheduling criteria, Scheduling algorithm, Multiprocessor scheduling, Real time scheduling, Algorithm evaluation.

UNIT – IV

MEMORY MANAGEMENT: Logical Vs Physical address space, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with Paging**VIRTUAL MEMORY:** Performance of Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing, Demand Segmentation**CASE STUDIES:** Features of Linux OS.

TEXT BOOKS:

1. E Balaguruswamy, Object Oriented Programming with C++, 2nd Edition, TMH, 2003. (For Units I & II)

2. Silberschatz and Galvin, Operating System Concepts, 4th John Wiley & Sons, 2002. (For Units III & IV)

REFERENCE BOOKS:

1. William Stallings, Operating Systems, 4th Edition, Pearson Education/PHI, 2003

2. Timothy Budd, An Introduction to Object Oriented Programming, 2nd Edition, Pearson Education, 2002.

EE224 CIRCUIT THEORY-II

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

POLYPHASE 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 Millman's method.

UNIT-II

NETWORK FUNCTIONS:

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. **TWO PORT NETWORKS:** Open circuit impedance and short circuit admittance parameters, transmission (ABCD, hybrid parameters, interrelation between them, image parameters, inter connection of 2-port networks

Unit – III

TRANSFORMED NETWORK ANALYSIS: Response of RL, RC, RLC circuits for impulse and pulse excitations using Laplace Transform method. Definition of operational/ transformed impedances and admittances of L, C and transformer with initial conditions; development of transformed networks incorporating initial conditions as sources and solution of transformed networks

Unit – IV

COUPLED CIRCUITS: Defining self and mutual inductance, coefficient of coupling, dot convention, development of circuit equations in time domain and frequency domain, solution of coupled circuits, series and parallel connections of two coupled coils, tuned circuit analysis (single and double tuned)-**FILTERS**: Low pass, high pass & band pass filters - frequency response, constant K – and M – filters.

TEXT BOOKS:

1. Engineering circuit analysis by W.H.Hayt & J.E.Kimmerly**,** 6th Edition,TMH, 2002
2. Circuits and Networks: Analysis and synthesis by A.Sudhakar and Shyammohan, 3rd Edition, TMH, 2006

REFERENCE BOOKS:

1. Electric Circuits by Edminister
2. Network analysis and synthesis bu F.F. Kuo
3. Basic circuit analysis by Cunningham & J.A.S tuller
4. Theory and problems of Electric Networks by B.R. Gupta

EE225 ELECTROMAGNETIC FIELD THEORY

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – 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, axwell'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

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

The 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

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Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Unit – I

Transformers:

Constructional features of transformers - EMF equation - no load and load phasor diagram - equivalent circuit of single phase transformers. Regulation – losses - efficiency and all day efficiency .Testing of transformers: OC & SC tests - Sumpner's test etc.

Unit – II

Auto transformers - Tertiary transformer winding - 3 phase transformer windings and its connections. Open delta - Scott connected transformers - 3 phase to 2 phase conversion. Parallel operation of transformer and its load sharing. Tap changing - methods of cooling

Unit – III

Poly Phase Induction Motors:

Rotating magnetic field in two phase & three phase systems - construction and operation of squirrel cage and slip ring 3-phase induction motors - torque equation and torque slip characteristics - equivalent circuit - Power losses – efficiency - testing of induction motors and circle diagrams.

Unit – IV

Types of starters - speed control of induction motors - Crawling and Cogging - Double cage rotors - Induction generators and their applications. **Single Phase Induction Motors:** Double field revolving theory - starting methods : split phase - capacitor start and run -shaded pole motors - characteristics and their applications - equivalent Circuit.

Text Books:

1. Electric Machinery by P.S. Bhimbra, Khanna Publications 7th edition
2. Generalized theory of Electric Machines by P.S. Bimbra Dhanpat Rai and sons,2000

Reference Books:

1. Theory of Alternating Current Machinery- by Langsdorf, Tata McGraw-Hill Companies, 2nd edition
2. Alternating Machines by A.F. Puchston, AG. Controad & Lloyd
3. Electrial Machinery & Transformers by Irving L. Kosow , PHI
4. Electric Machines –by I.J.Nagrath & D.P.Kothari,Tata Mc Graw Hill, 7th Edition.2005

EE 261 ELECTRO MECHANICS LAB – II

Lectures	:	3 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

LIST OF EXPERIMENTS:

1. Determination of Z, Y parameters of a given two port network
2. OC & SC tests on single - phase transformer
3. Load test on single - phase transformer
4. Sumpner's test on Transformers
5. Scott Connection of Transformers
6. Parallel Operation of Two Single - Phase Transformers
7. Load test on 3 - phase squirrel cage induction motor
8. Load test on 3 - phase slip ring induction motor
9. No load and Blocked rotor test on 3 - phase induction motor
10. Brake test on single - phase induction motor
11. Determination of Equivalent Circuit of Single - Phase Induction Motor
12. Parallel operation of 3 – phase transformers
13. Harmonic analysis of transformer
14. Real Power flow Control of 3-Phase Induction Generator
15. Separation of losses of 3-phase Induction motor

Note: Minimum 10 experiments should be conducted.

EE262 / MEL03 FLUID MECHANICS & I.C ENGINES Laboratory

Lectures	:	3 Periods/Week, Tutorial:0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Part-I

1. Flash and fire points of a fuel using Cleveland apparatus.

2. Viscosity of a lubricating oil using Saybolt viscometer

3. Calorific value of a gaseous fuel using Junker's Gas

Calorimeter

4. Performance test on single cylinder, 4 - stroke petrol engine.

5. Performance test on single cylinder, 4 - stroke diesel engine.

6. Performance test on four cylinder, 4 – stroke petrol engine.

7. Port timing and valve timing diagrams.

Part –II

8. Verification of Bernoulli's theorem.

9. Determination of friction factor of pipes

10. Measurement of force due to impact of jets on vanes of different types.

11. Performance study on Pelton wheel turbine.

12. Performance study on Francis turbine

13. Performance study on Kaplan turbine.

14. Performance study on single stage centrifugal pump.

Note: Minimum 10 experiments should be conducted.

EE263 / ITL01 Object Oriented Programming LAB

Lectures	:	3 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

1. Create a class HUGEINT by which we would be able to use much wider range of integers. Perform addition operation on two HUGEINTs.

2. Create a class TIME with appropriate data members to represent TIME. Construct a class implementation section to compare two TIMEs, to increment TIME by one second, to decrement TIME by one second and appropriate constructors to create TIME objects.

3. Write a class declaration for DATE and allow the operations to find nextday(), previousday(), leapyear(), comp()- which returns later DATE with appropriate constructors and destructors.

4. Create a user defined datatype STRING, allow possible operations by overloading (Relational operators,[], ( ), <<,>>, =).

5. Define RATIONAL class. Allow possible operations on RATIONALs by overloading operators(Arithmetic, Unary operators,<<,>>).

6. a. A program to implement Single inheritance
   b. A program to implement Multiple inheritance
   c. A program to implement Hierarchical inheritance
   d. A program to implement Multipath inheritance

7. a. A program to implement runtime polymorphism
   b. A program to implement abstract base class concept.

Note: Minimum 10 experiments should be conducted.

EE311: LINEAR IC'S AND APPLICATIONS

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

UNIT – I

OPERATIONAL AMPLIFIERS: Operational amplifier and block diagram representation - op-amp with negative feedback. Block diagram representation of feedback configurations - differential amplifier with one op-amp - input offset voltage, input bias current - input offset current - total output offset voltage - frequency response of op-amp - stability - slew rate. **OP-AMP APPLICATIONS:** The summing amplifier - Differential and instrumentation amplifiers - Voltage to current and current to voltage conversion - The Op Amp with complex impedance - Differentiators and integrators - Non Linear Op Amp circuits - Precision rectifiers.

UNIT – II

OSCILLATORS: Oscillator principles - Oscillator types - Frequency stability - Phase shift oscillator - Wein bridge oscillator - Quadrature oscillator - Square-wave generator - Triangular wave generator - Saw tooth wave generator - Voltage controlled oscillator.

COMPARATORS: Introduction to comparator - Basic comparator - Zero-crossing detector - Schmitt Trigger - Comparator characteristics - Limitations of Op-Amps as comparators - Voltage limiters

UNIT – III

CLIPPERS, CLAMPERS & CONVERTERS: Positive and negative clippers - Positive and negative clampers - Absolute value output circuit - Peak detector - Sample and hold circuit. D/A conversion fundamentals - Weighted resistor summing D/A Converter - R-2R Ladder D/A converter. A/D conversion: Ramp converters - Successive Approximation A/D converters - Dual slope converters - Parallel A/D converters - Tracking A/D converters.

UNIT – IV

APPLICATIONS OF SPECIAL ICS: The 555 timer - 555 as Monostable and Astable Multivibrator and applications. Phase Locked Loops - Operating principles - Monolithic PLLs - 565 PLL applications - μA 723 Voltage Regulator and its design. **ACTIVE FILTERS:** Active LP and HP filters - Band pass filters: Wideband - Narrow Band pass filters - Band stop filters - State variable filters - All pass filters.

TEXT BOOKS:

1. Rama Kant A. Gayakwad, Op-Amps and Linear Integrated Circuits, 4th Edition, PHI/ Pearson Education, 2003

2. D.Roy and Choudhury, Shail B.Jain, Linear Integrated Circuits, 2nd Edition, New Age International, 2003.

REFERENCE:

1. Denton J Dailey, Operational Amplifiers and Linear Integrated Circuit Theory and Applications TMH
2. J. Michael Jacob, Applications and Design with Analog Integrated Circuits, 2nd Edition, PHI, 2003.

EE312: TRANSMISSION AND DISTRIBUTION

Lectures	:	4Periods/Week, Tutorial:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Syllabus:
Unit – I

Transmission line parameters:

Expressions for inductance and capacitance of single phase and 3-phase lines of symmetrical and transposed configurations, concept of self GMD (GMR) and mutual GMD, double circuit lines and bundled conductors, effect of ground on capacitance, line charging KVAR calculations. Inductive interference

Unit – II

Transmission line theory:

Short, medium and long lines, regulation and efficiency, Pie, T and rigorous methods of solution, ABCD constants, sending and receiving end power equations and power circle diagrams, surge impedance loading, Ferranti effect, Corona, factors affecting corona, critical voltages and power loss; Radio interference due to Corona

Mechanical Design:

Mechanical design, sag and stress in overhead conductors suspended at level supports and at different levels, effect of wind and ice on sag, use of sag templates and string charts; conductor vibration-dampers

Unit – III

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, busbar arrangements – single busbar, sectionalized single busbar, main and transfer busbar system, sectionalized double busbar system, ring mains, group switching,

Unit – IV

Insulators: Types of insulators, voltage distribution in a string of suspension insulators,

Grading of insulators: Failure of insulator and testing, Arcing horns

Underground Cables: Types of cables, laying of cables, insulation resistance, electric stress and capacitance of single core cable, use of intersheath, 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.

Text Books:

1. Electrical Power Systems by C L Wadhwa, New Age Int. 4/E

2. Elements of Power system analysis by W.D.Stevenson3. Electric Power Generation, Transmission & Distribution by S.N.Singh, PHI, 2003

Reference Books:

1. A Course in Electrical Power by Soni,Gupta and Bhatnagar

2. Electrical power Transmission by Waddicar

3. Transmission and Distribution by H.Cotton

EE 313/EC07 ELECTONIC CIRCUITS-II

Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

TRANSISTOR AT HIGH FREQUENCY:

Hybrid-pi CE transistor model, Hybrid-π Conductances, Hybrid-π Capacitences, Validity of Hybrid-π Model, Variation of Hybrid-π model, CE short circuit current gain, CE current gain with Resistive load, Single stage CE amplifier response, Gain Bandwidth product, Emitter Follower at High frequencies

UNIT – II

FET AT HIGH FREQUENCY: FET small signal model, CS / CD configurations at high frequencies.

REGULATED POWER SUPPLIES: Design and analysis of Series and Shunt regulators using discrete components, Protection techniques, Switching Mode Power Supplies, UPS.

UNIT – III

MULTISTAGE AMPLIFIERS:

Distortion in amplifiers, Frequency response of an amplifier, Bode plots, Step Response of an Amplifier, Band pass of Cascaded stages, RC coupled amplifier, Effect of Emitter Bypass Capacitor on Low-frequency response, High-frequency Response of two cascade CE Transistor Stages

UNIT – IV

TUNED AMPLIFIERS:

Band–Pass Amplifiers, Parallel-Resonant Circuit, Impedance Variation at frequencies Near Resonance, Bandwidth of Parallel-Resonant Circuit, Transformation from the series-Resonance form, Single tuned amplifier, Tuned primary amplifier, Tuned secondary FET amplifier, Double tuned transformer coupled amplifier, Stagger tuned amplifier.

TEXT BOOKS:

1. Jacob Millman and Christos C Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, TMH, 2003

2. John D Ryder, Electronic Fundamentals and Applications: Integrated and Discrete Systems, 5th Edition, PHI, 2003

3. Theodore F Bogart Jr., Jeffrey S Beasley and Guillermo Rico, Electronic Devices and Circuits, 6thEdition, Pearson Education, 2004.

REFERENCE BOOK:

1. Donald L. Schilling and Charles Belove, Electronic Circuits-Discrete and Integrated, 3rd Edition, TMH, 2002

EE 314: GENERATION OF ELECTRICAL POWER

Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

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 Tariff.

Unit – II

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.

Thermal power stations: Selection of site for thermal station – layout and salient features - boilers – economizers – condensers – coal handling – feed water treatment - steam turbines – turbo generators. **Hydroelectric Stations:** Hydrology – hydrographs – mass curves – classification of hydroelectric plants - general arrangement and operation of hydroelectric plants and its function.

Unit – III

Nuclear Power Stations: Principles of nuclear power station – basic factors in designing of reactors – pressurized water reactor – boiling water reactor – CANDU reactor – liquid metal cooled reactor – shielding and safety precautions.

Energy from Biomass: Biomass conversion technologies- biogas generation-Classification of biogas plants-advantages and disadvantages of floating drum plant and fixed dome type plant**.**

Unit – IV

Solar Energy: Basic of solar energy – solar constant – extra terrestrial radiation – types of conversion systems – solar thermal power plants – solar pond - solar cell.

Wind Energy: Principles of wind power – types – wind turbine operation, types of wind generators.Tidal energy – Geo thermal Energy - Fuel cells.

Text Books:

1. Generation of Electric Power by B.R. Gupta S. Chand & Company Ltd
2. Non conventional energy sources by G. D. Rai Khanna Publishers, New Delhi

Reference Books:

1. Solar power Engineering by B.S.Magal TMH Publishing Company. Ltd., New Delhi
2. A Course in electric power by M.L.Soni, P.V.Gupta, U. S. Bhatnagar and A. Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 2001.
3. Power plant Technology by MML.Wakil TMH Publishing Company. Ltd., New

EE315: ELECTRICAL MEASUREMENTS

Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit - I

Instruments: Classification of instruments – Construction and principle of operation of Permanent magnet moving coil - moving iron – dynamometer – induction type of instruments. Measurement of current, voltage, power, energy and reactive power in single phase and three phase circuits. Construction and principle of operation of Power factor meters – frequency meters and synchroscope.

Unit – II

Instrument Transformers: CTs, PTs principle of operation – errors - testing. **Bridges:** Measurement of inductance, capacitance and resistance by bridge methods - Maxwell's - Anderson's - Wien's - Schering's - Heaviside's - Campbell's - Kelvin's double bridge.

Unit – III

Magnetic Measurements: Ballistic galvanometer – Calibration by Hibbert's magnetic standard - B-H loop – flux meter – measurement of permeability - Epstein's square.**Transducers:** Classification, Principles and selection of transducers - LVDT - Thermister - Thermo couple - Strain Guage

Unit – IV

Digital Instruments: Principle of operation of DVM's – display devices LEDs and LCDs **Oscilloscope:** Basic operation – deflection mechanism – time base circuits - vertical amplifiers - alternate and chop modes – applications of CRO.

Text Books:

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition, Wheeler Publishing, 1999.
2. Electrical & Electronic Measurement & Instruments by A.K.Shawney Dhanpat Rai & Co 17th edition 2000.

Reference books:

1. Electrical Measurements – by Buckingham and Price, Prentice – Hall, 1961
2. Electrical Measurements and Measuring Instruments by Harris John Wiley
3. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers.

EE316: ELECTROMECHANICS-III

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit – I

Synchronous Generators:Construction - e.m.f. equation with sinusoidal flux - winding factors - harmonics in generated voltage and their suppression - armature reaction - synchronous impedance - vector diagram - load characteristics - methods of determining regulation – direct load - EMF, MMF, ZPF and ASA.

Unit – II

Blondel two reaction method for salient pole machine - phasor diagram - slip test - regulation of salient pole machines - parallel operation - synchronizing with infinite bus bars - synchronizing power - effect of variation of excitation and mechanical input on parallel operation - load sharing – losses and efficiency.

Unit – III

Synchronous Motor: Theory of operation - starting methods - phasor diagrams - variation of current and power factor with excitation - minimum and maximum power for a given excitation and power circles - V and inverted V curves - hunting and its prevention - synchronous condenser and its applications.

Unit – IV

Single Phase Series (Universal) motors: Principle of operation and characteristic of AC series motors - Repulsion motors and its applications. **Single phase Synchronous motors:** Basic concepts and principle of operation and characteristics of reluctance motor and hysteresis motor. **Stepper Motor**: Variable reluctance stepper motor - permanent magnet stepper motor - principle of operation of linear induction motor and its applications.

Text Books:

1. Electric Machinery by P.S. Bhimbra, Khanna Publications 7th edition
2. Generalized theory of Electric Machines by P.S. Bimbra Dhanpat Rai and sons,2000

Reference books:

1. Alternating current Machines by A.F. Puchatein, T.C. Lloyd and A.G. Conarad Asia publishing house, 1962
2. Theory of Alternating Current Machinery by Langsdorf, Tata Mc Graw-Hill, 2nd edition.
3. Electric Machinery – by A.E. Fitzgerald, C.Kingsley and S.Umans, Mc Graw-Hill Companies, 6th edition, 2003

EE351: ELECTRICAL MEASUREMENTS LAB

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

LIST OF EXPERIMENTS:

1. Calibration and testing of single – phase energy meter
2. Kelvin's Double Bridge – Measurement of resistance – Determination of tolerance
3. Schering Bridge – capacitance measurement and tan δ measurement
4. Anderson Bridge – inductance measurement
5. Measurement of 3-phase active and reactive power in three phase circuits.
6. Measurement of 3-phase power using 3-Voltmeter and 3-Ammmeter methods
7. Measurement of frequency using CRO
8. Measurement of strain using strain guage
9. Tracing of B-H curve using CRO
10. LVDT characteristics, calibration and displacement measurement.
11. Energy meter calibration by phatom loading
12. Frequency measurement by Wein's Bridge
13. Measurement of earth resistance by earth tester & fall of potential method
14. Measurement medium resistance using Wheatstone Bridge
15. Testing of current transformer.
16. Measurement of dielectric strength by transfer oil testing kit

Note: Minimum 10 experiments should be conducted.

EE352: ELECTRONICS LAB-II

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

LIST OF EXPERIMENTS:

1. Two stage RC coupled Amplifier
2. Design of voltage shunt feedback amplifier and determination of voltage gain, input impedance and output impedance with and without feedback
3. Class B push pull amplifier
4. Complementary symmetry amplifier
5. Design of RC phase shift oscillator
6. Design of LC oscillator
7. Design of series voltage regulator
8. Linear wave shaping
9. Non-linear wave shaping
10. Bistable multivibrator
11. Monostable multivibrator
12. Astable multivibrator
13. Schmitt trigger
14. UJT relaxation oscillator
15. Blocking oscillator

Note: Minimum 10 experiments should be conducted.

EE 353/ EN 51/61 SOFT SKILLS LAB

Lectures	3 Periods/ Week	Continuous Assessment	40
Final Exam	3 Hours	Final Exam. Marks	60

1. Non-Verbal communication

a) Voluntary & Involuntary Body Language
b) Facial Expressions
c) Kinesics
d) Oculesics
e) Haptics
f) Proxemics
g) Chronemics
h) Para Linguistics

2. Life skills

a) Good Attitude & Self Motivation
b) Social Behavious & Social Norms
c) Ethics, Values and positive Work Ethics
d) Desire to learn and Responsibility

3. Emotional Intelligence

a) Self Awareness
b) Self Control
c) Self Motivatioin
d) Empathy
e) Relationship skills
f) Self Esteem

4. People Skills

a) Effective Listening
b) Managing Stress
c) Persuading Techniques
d) Questioning Techniques – Close End, Open End Questions and answers
e) Role Perception

5. Cognitive Skills

a) Situational Analysis
b) Critical Thinking
c) Lateral Thinking
d)Creative Thinking

6. Employability

a) Corporate Information
b) Group Discussion
c) Team Building
d) conflict Management
e) Negotiating skills
f) Interview Techniques

Reference Books:

1. The Definitive Book of Body Language by Allan & Barbara Pease
2. You Can Win by Shiv Khera
3. Lateral Thinking by Edward De Bono
4. How to Prepare for Group discussions and interview by Hari Mohan Prasad, Rajnish Mohan, 2nd Ed. TMH Pub.
5. Emotional Intelligence by Daniel Goleman
6. The Seven Habits of Highly effective people by Stephen R. Covey
7. Working in Teams by Sandy Pokras

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

EE 321 PROFFSSIONAL ETHICS AND HUMAN VALUES

Course Syllabus:

Unit – 1

Human Values: Integrity, Work Ethic, Service Learning, Civic Virtue, Caring, Honesty, Courage, Co-Operation, Commitment, Empathy, Self Confidence

Unit -11

Engineering Ethics: Senses Of 'Engineering Ethics, Variety of Moral Issues, Types of Inquiry, Moral Dilemmas, Moral Autonomy, Kohlberg's Theory, Gilligan's Theory, Professions and Professionalism, Professional Ideals and Virtues, Theories about Right Action, Uses Of Ethical Theories.

Unit – 111

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, Weapon Development, Engineers as Managers, Consulting Engineering,
Engineering as Expert Witnesses and Advisors,

Text Books:

1. Mike Martin and Roland Schinzinger, Ethics In Engineering, Mc Graw Hill, New York 1996.
2. Govindarajan. M, Natarajan. S, Senthilkimar.V.S, Engineering Ethics, Phi, 2004.

Reference Books:

1. Charles D Fleddermann, Engineering Ethics, Prentice Hall, New Jersey, 2004.
2. Charles E Harris, Michael S Pritchard and Michael J Robins, Engineering Ethics Concepts and Cases, Thomson Learning, United States, 2000.
3. John R Boatright, Ethics and The Conduct Of Business, Phi, New Delhi, 2003.
4. Edmund G Seebauer And Robert L Barry, Fundamentals Of Ethics For Scientists.

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

EE322: MICROPROCESSORS AND MICROCONTROLLERS

Course Syllabus:

UNIT – I

Microprocessor: introduction to microcomputers and microprocessors, introduction and architecture of 8086 family, addressing modes, instruction description and assembler directives of 8086 microprocessors, simple program.

UNIT – II

8086 programming and system connections: Program development steps, writing programs for use with an assembler, assembly language program development tools, writing and using procedures and assembler macros.Maximum and minimum mode system, addressing memory and ports in microcomputer system. 8086 interrupts and interrupt responses.

UNIT – III

Digital Interfacing : Programmable parallel ports, handshake IO, interfacing Microprocessor to keyboards. Analog interfacing: DAC principle of operation, specifications and different types of DACs and interfacing. Programmable devices: Introduction to Programmable peripheral devices 8254, 8259, 8251, DMA data transfer, RS232 communication standard

UNIT – IV

Introduction:-Introduction to microcontrollers, comparing microprocessors and microcontrollers, Architecture:- Architecture of 8051, pin configuration of 8051microcontroller, hardware input pins, output pins ports and external memory, counters and timers, serial data input and output and interrupts. Interfacing a stepper motor, ADC, temperature sensor and DAC.

TEXT BOOKS:

1. Duglus V. Hall, Microprocessor and Interfacing, Revised 2nd Edition, TMH,2006.
2. Kenneth J. Ayala, The 8051 Microcontroller Architecture Programming and Applications, 2nd Edition, Penram International Publishers (I), 1996.

REFERENCE BOOKS:

1. Ray and BulChandi, " Advanced Micro Processors", Tata McGraw -Hill.
2. Kenneth J Ayala, " The 8086 Micro Processors Architecture, Programming and Applications",Thomson Publishers, 2005
3. Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design, 2nded., Liu & Gibson

EE323: POWER SYSTEM ANALYSIS .

Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus

UNIT – I

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 - per unit quantities - changing the base - selection of base - per-unit impedances of three winding transformers - Advantages of per-unit computations- Formation Y-Bus.

UNIT – II:Power flow control: Power angle equation of a synchronous machine- effect of synchronous machine excitation - power angle equation for power system with single and multi machines. **Symmetrical Faults:** Transients in RL series circuit - short-circuit currents and reactances of synchronous machines - internal voltages of loaded machines under transient conditions - selection of circuit breakers. Formation 0f Bus Impedance matrix by using Z-Bus building algorithm. Analysis of symmetrical faults using bus impedance matrix

UNIT – III:Symmetrical components and Networks: Introduction – operator 'a' – resolution of three unbalanced phasors 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) Elements of power system analysis by W D Stevenson Jr Fourth Edition TMH International student edition

2) Modern power system analysis by D.P. Kothari and I.J. Nagrath , TMH 3rd edition 2004

Reference Books:

1) Electrical power systems by C.L. Wadhwa, New age International (P) Limited 3rd edition

2) Power system stability by Kimbark Vol – I Willey Publications , Inc

3) Power system stability and control by P. Kundur , TMH 1998

4) Transient stability of power systems from theory to practice by M. Pavella & P.G.Murthy, John Wiley & sons, 1994

5) Power System Analysis and Design by B. R. Gupta , 3rd Ed. , Wheeler publishing.

EE324: POWER ELECTRONICS

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit-I

Power devices:

Introduction-Thyristor characteristics - Two transistor model of Thyristor - Thyristor turn on and turn off methods - Firing circuits R, RC, UJT and Ramp comparator Firing circuits - Protection of Thyristor - Series and parallel operation of Thyristors power transistors - SCS, LASCR, DIAC, TRIAC, IGBT, MOSFET and their characteristics – ratings - TRIAC triggering – GTO characteristics - Introduction to digital firing schemes.

Unit-II

Converters: Principles of phase controlled converter operation - single phase half wave converters - single phase semi converter and single phase full converters with R, RL types of load - three phase half wave converters –three phase full wave converters –performance of single phase and three phase converters - single phase dual converter - three phase dual converter with R, L loads - effects of source and load inductance - pulse width modulation control for PF improvement.

Unit-III

Inverters: Principle of inverter operation - single phase inverters- series, parallel inverters - Mc Murray Bedford half bridge inverters - three phase inverters (120,180 modes of operation) - voltage source inverters - current source inverters - pulse width modulated inverters.

Unit-IV

Choppers: Principle of choppers - step up and step down choppers - different classes of chopper circuits and their analysis - Voltage and Current commutated Choppers. **Cyclo converters:** Principle and operation of single - phase and three phase cyclo converters and applications.

TEXT BOOKS:

1. Power Electronics, circuits, devices and applications by M.H.Rashid PHI 3rd edition
2. Power Electronics by M.D.Singh and Khanchandani TMH, 2nd Edition

REFERENCE BOOKS:

1. Power Electronics by P.S. Bhimbra Khanna publications, 3rd Edition 2006
2. Power Electronics by PC Sen, Tata MC Graw-Hill Publishing company Limited.
3. Modern power electronics and AC drives by Bimal k.bose Pearson Prentice Hall, 4th Impression- 2007.
4. Power Electronics by W. Launder 2ndedition,1993
5. Power Electronics – by Vedam Subramanyam, New Age International (P) Limited, 2nd edition 2006

EE325: CONTROL SYSTEMS

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

UNIT – I

Introduction: Basic concept of control system. Types of feed back control systems and its effect on overall gain – Liner time invariant, time variant systems and non linear control systems Block diagram representation of control systems – signal flow graph. Mathematical models and Transfer functions of Physical systems. **Components of control systems:** Servo motors – synchro transmitter & receiver

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 over shoot, rise time, band width.

UNIT - III

Stability analysis in the complex plane: Absolute, relative, conditional, bounded input – bounded output, zero input stability, conditions for stability, Routh –Hurwitz criterion.

Frequency domain analysis: Introduction – correlation between time and frequency responses – polar plots – Bode plots – Nyquist plots.

UNIT – IV

Root Locus Technique: Introduction - Construction of Root Locus

State space analysis: Concepts of state variables and state models – diagonalisation – solution of state equations – Concepts of controllability and Observability

TEXT BOOKS:

1. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 3rd edition.
3.Digital control systems 2nd edition by KUO, oxford university press.

REFERENCE BOOKS:

1. Modern Control Engineering by Katsuhiko Ogata Prentice Hall of India Pvt. Ltd.,3rdedition
2. Control systems by A.Anand Kumar, PHI (p) limited-2007.
3. Control systems by A.Nagoor Kani, RBA publications 1st edition.
4. Advanced control theory by A. Nagoor Kani RBA publications 2nd edition.

EE 326(A): DIGITAL SIGNAL PROCESSING

Lectures	:	4 Periods/Week, Tutorial:0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

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: Z-transform theorems and properties, Inverse Z transform by counter integration ,by partial fraction expansion - Respons**e** of systems with rational system functions, transient study state response, causality and stability - The one side Z-transform definition and properties, solution of difference equations

UNIT – II

DFT AND FFT: Discrete Fourier Series - Properties of DFS - Discrete Fourier Transform - Properties of DFT - Linear convolution using DFT - Computations for evaluating DFT - Decimation in time FFT algorithms - Decimation in frequency FFT algorithm - Computation of inverse DFT.

UNIT – III

IIR FILTER DESIGN TECHNIQUES: Introduction - Properties of IIR filters - Design of Digital Butterworth and Chebyshev filters using bilinear transformation - Impulse invariance transformation methods. Design of digital filters using frequency transformation method.

UNIT – IV

FIR FILTER DESIGN TECHNIQUES: Introduction to characteristics of linear phase FIR filters - Frequency response. Designing FIR filters using windowing methods: Rectangular window - Hanning window - Hamming window - Generalised Hamming window –Bartlett triangular window - KASIER window and design of FIR filters using frequency sampling method, Comparison of IIR and FIR filters.

REALISATION OF DIGITAL FILTERS: Direct – Canonic – Cascade - Parallel and Ladder realizations.

TEXT BOOKS:

1.John G.Proakis, Dimitris G Manolakis, digital Signal Processing: Principles, Algorithms and Applications, Pearson Education / PHI, 2003

2. Alan V Oppenheim and Ronald W Schafer, Digital Signal Processing, Pearson Education / PHI, 2004.

REFERENCE BOOKS:

1. Lonnie C Ludeman, Fundamentals of Digital Signal Processing, John Wiley & Sons, 2003.

2. S K Mitra, Digital Signal Processing: A Computer Based Approach, 2nd Edition, TMH, 2003

3. Johnny R. Johnson, Introduction to Digital Signal Processing, PHI, 2001.

4. Andreas Antoniou, Digital Signal Processing,TMH Edition, 2006.

EE 326(B): ADVANCED CONTROL SYSTEMS

Lectures	:	4 Periods/Week, Tutorial:0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit-I

Sampled-data Control Systems:

Sample and hold (S/H) devices - block diagram representation of S/H device - D/A conversion - A/D conversion. mathematical modeling of the sampling process – uniform rate finite pulse width sampler - amplitude spectra of I/O signals of a finite pulse width sampler - sampling theorem - ideal sampler and its amplitude spectra - data reconstruction and filtering of sampled signals. the zero order hold (ZOH) - frequency domain characteristics of the ZOH.

Unit-II

The Z-transform:

Motivation - definition of Z-transform - Z-transform of elementary functions. Important properties and theorems on shifting (real translation and complex translation) - initial value - final value - partial differentiation and real convolution - relationship between s and z and the s-plane and z-plane. Stability tests of sampled - data systems – bilinear transformation and Routh Hurwitz criterion - Jury's test.

The inverse z-transform by direct division and by partial fraction expansion z- Transform method for solving difference equations. The z- transfer function (pulse transfer function) - Block diagram analysis of sampled-data control systems. State space analysis of linear - time invariant discrete- time / sampled-data systems - State transition matrix and pulse transfer function matrix.

Unit-III

Nonlinear systems:

Introduction - typical behavior of nonlinear systems - the frequency-amplitude dependence - jump resonance - sub harmonic oscillations - self excited oscillations or limit cycles - frequency entertainment. Common physical nonlinearities - saturation, friction, backlash, hysteresis, dead zone and relay. Classification of singular points based on the location of the eigen value in the s-plane of the linearized version - nodal point - saddle point - focus - center. the phase plane analysis of second order nonlinear systems- construction of phase trajectories by isocline method.

Lyapunov's stability theory:

State space description of linear time - invariant continuous - time autonomous systems and the equilibrium state;

Stability theorems in the sense of Lyapnov – stable - asymptotically stable - globally asymptotically stable. Instability theorem - sign definite functions.

Lyapnov functions and Lyapnov's theorems on stability and asymptotic stability

Stability analysis of linear time - invariant continuous - time systems using Lyapunov functions- solution of the Lyapnov matrix equation $A^T P + P A = - Q$.

Unit- IV

Fuzzy Control:

Introduction – model – based control (Vs) rule - based control – premise (antecedent) and conclusion (consequent) rules; Fuzzy quantification of knowledge- what is Fuzzy logic - Fuzzy sets - Fuzzy operations - Fuzzy relations.Fuzzy inference - Mamdani Fuzzy rules - Takagi- Sugeno Fuzzy rules. Designing a Fuzzy logic controller - step-by-step procedure for designing a water heating system. Introduction to Matlab aided design with Fuzzy logic toolbox and SIMULINK.

TEXT BOOKS:

1. Digital Control systems by B.C.Kuo, Oxford University press
2. Digital control and state variable methods by M.Gopal, TMH
3. Discrete-Time Control systems by Katsuhiko Ogata, Pearson Education.
4. Modern Control engineering by K.Ogata, PHI, 2nd Edition

REFERENCE BOOKS:

1. Digital Control Engineering by M.Gopal, Wiley Eastern, 1988
2. Digital Control systems by P.N. Paraskevopoulos, Prentice Hall (London)
3.Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications by Rajasekharan and pai, PHI

EE 326(C): COMPUTER NETWORKS

Lectures	:	4 Periods/Week, Tutorial:0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit – I

Network Layer: Design Issues - Routing Algorithms - Congestion Control Algorithms - Quality of Services - Internet Working - Network Layer in the Internet: IP – Protocol - IP Address Internet Control Protocols: ICMP, ARP, RARP.

Unit – II

Transport Layer: Transport Services - Elements of Transport Protocols - simple Transport protocol- Internet Transport Protocols: TCP & UDP

Unit– III

Application Layer: DNS - E-mail - WWW: Architectural Overview. Multimedia: Introduction to Digital Audio - Audio compression - Introduction to Video - Video Compression - Video on Demand.

Unit – IV

Network Security: Cryptography - symmetric algorithms – Public key Algorithms - Digital signatures. Management of Public keys - Authentication Protocols - E-mail Security.

TEXT BOOKS:

1. Computer Networks (4^{th} Ed) by Andrew S. Tanenbaum, PHI

REFERENCE BOOKS:

1. Computer Networks- A top-down approach featuring the Internet by Kurose & Ross, Pearson Education.
2. Cryptography and Network Security- Principles and Practice 2^{nd} ed. Pearson Education

EE326/D ARTIFICIAL NEURAL NETWORKS

Lectures	:	4 Periods/Week, Tutorial:0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

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Course Syllabus

Unit-I

Introduction: Neuron models - network architectures - AI and neural nets. Learning process: Error correction learning - Memory based learning - Hebbian learning - competitive learning - learning with and without a teacher adaptation - statistical learning theory.

Unit-II

PERCEPTRONS: Single layer perceptrons: Adaptive filtering problem - linear least square filters - LMS algorithm - learning curves - annealing techniques - perceptron and Bays classifier. Multilayer perceptrons: Back propagation algorithm - XOR problem - feature detection - back propagation and differentiation - Hessian Matrix - cross validation Network pruning techniques.

Unit-III

RADIAL BASIS NETWORKS: Covers theorem on the separability of patterns - Regularization theory and networks - Generalized RBF networks - approximation properties of RBF networks - comparison with Multilayer perceptrons.

Unit-IV

SELF ORGANISING MAPS: Introduction – self organizing maps - SOM algorithm - properties of the feature map - learning vector quantization - contextual maps.

APPLICATIONS OF ANN: Introduction - direct Applications - pattern classification - Associative Memories – Optimization - control Applications. Applications in speech and image processing.

TEXT BOOKS:

1. Neural networks- a comprehensive foundation by Simon Haykin, Pearson Education
2. Artificial Neural networks by B.Yegnanarayana , PHI
3. Neural networks, fuzzy logic and genetic algorithms: synthesis and applications by S.Rajasekharan and Y.A. Vijaya Lakshmi pai , PHI

REFERENCE BOOKS:

1. Introduction to Neural systems by Zurada, Jaico Pub.
2. Neural networks design by M.T.Hagon, H.B.Demunth and Mark Beale, Thompson Learning Vikas pub.
3. An introduction to Neural networks by James A. Anderson , PHI

EE361: ELECTROMECHANICS LAB -III

Lectures	3 Periods/ Week	Continuous Assessment	40
Final Exam	3 Hours	Final Exam. Marks	60

List of Experiments:

1. Regulation of alternator by synchronous impedance and MMF methods
2. Regulation of alternator by ZPF & ASA methods
3.. Synchronization of alternator with infinite bus bar-current locus diagram
4. V and inverted V curves of synchronous motor.
5. Synchronous motor performance with constant excitation
6. Separation of losses in single – phase transformer.
7. Measurement of Xd and Xq of a three phase alternator.
8. Load test on Universal motor.
9. Measurement of Xd" and Xq" of a three phase alternator.
10. Power factor correction using synchronous motor
11. Sumpners test on 3-ϕ transformer
12.Reactive power control by using 3-ϕ tap changing transformer
13.Characteristics of phase shifting transformer
14.Load test on 3-ϕ alternator
15. Load test on hysteresis motor

Note: Minimum 10 experiments should be conducted.

EE362: MICROPROCESSORS & MICROCONTROLLERS LAB

Lectures	3 Periods/ Week	Continuous Assessment	40
Final Exam	3 Hours	Final Exam. Marks	60

Experiments Based on ALP (8086)

Programs on Data Transfer Instructions.

1. Programs on Arithmetic and Logical Instructions.
2. Programs on Branch Instructions.
3. Programs on Subroutines.
4. Sorting of an Array.
5. Programs on Interrupts (Software and Hardware).
6. 8086 Programs using DOS and BIOS Interrupts.

Experiments Based on Interfacing & Microcontroller (8051)

7. DAC Interface-Waveform generations.
8. Stepper Motor Control.
9. Keyboard Interface / LCD Interface.
10. Data Transfer between two PCs using RS.232 C Serial Port
11. Programs on Data Transfer Instructions using 8051 Microcontroller.
12. Programs on Arithmetic and Logical Instructions using 8051 Microcontroller.
13. Applications with Microcontroller 8051.

Note: Minimum 10 experiments should be conducted.

EE363: CONTROL SYSTEMS LAB

Lectures	3 Periods/ Week	Continuous Assessment	40
Final Exam	3 Hours	Final Exam. Marks	60

LIST OF EXPERIMENTS:

1. Time response of second order systems
2. Characteristics of synchros.
3. Effect of feedback on D.C servomotor.
4. Transfer function of D.C motor
5. Effect of P, PD, PID controller on a second order system
6. Simulation of transfer functions using operational amplifier
7. Lag and lead compensation – Magnitude and phase plot
8. Transfer function of D.C generator
9. Temperature controller using PID
10. Characteristics of magnetic amplifier
11. Characteristics of A.C servo motor
12. Stepper motor control
13. D.C. position control
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.

EE411: INDUSTRIAL MANAGEMENT & ENTREPRENEURSHIP DEVELOPMENT

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT- I

General management: Management definition, functions of management and principles of management. Forms of Business Organization: Salient features of Sole Proprietorship, Partnership, Joint Stock Company; Private Limited and Public Limited companies; Cooperative and Government owned companies; Merits and Demerits of above types;

Marketing Management: Functions of Marketing; Concepts of Selling and Marketing-Difference; Market Research; Product pricing; Distribution channels; Marketing mix (4 Ps); Advertising and sales promotion; Product life cycle.

UNIT- II

Production and Materials Management: Functions of Production planning and control; Production systems-Types; Inventory control-Relevant costs, EOQ, Deterministic single item model with static demand, ABC, VED and FSN analysis; Introduction to MRP; **Financial Management**: Concept of time value of money; Interest formulae; Present and Future worth amounts for different cash flow patterns; Evaluation of alternative investment proposals (Capital budgeting); Types of Capital-Fixed and Working capital; Working capital management- Factors and Principles; **Depreciation**- Straight line depreciation, declining balance and Sum of Years digits methods.

UNIT- III

Personnel Management: Functions of personnel management, human resource planning, recruitment, selection, placement, training and development and performance appraisal. Motivation theories, leadership styles.

UNIT- IV

Entrepreneur Development: Introduction, Entrepreneural 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; Product, Process and Plant Design- Product analysis and Product Design process. Steps in process design and Plant Design.

Text Books:

1. Industrial Engineering and Operations Management, S.K.Sharma, Savita Sharma and Tushar Sharma.
2. Industrial engineering and production management, Mahajan
3. Industrial Economics, R.R.Bharatwal

Reference Books:

1. Operations Management, Joseph G Monk.
2. Production, Planning and Control, Samuel Eilon.
3. Marketing Management, Phillip Kotler.
4. Financial Management I.M.Pandey.
5. Projects, Prasanna Chandra.
6. The Essence of Small Business, Barrow colin.
7. Small Industry Ram K Vepa.

EE412: POWER SYSTEM OPERATION CONTROL& STABILITY

Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

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.

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

Reactive power and voltage control:

Reactive power control in synchronous generators:The role of excitation system- exciter, generator and sensor models , simplified AVR block diagram, steady state response for a step change in terminal voltage.

Reactive power compensation of loads : Shunt compensating devices

Transmission line compensation : Series compensation, shunt compensation, static VAR compensators – thyristor controlled reactors (TCR) , thyristor switched capacitors (TSC) , combined TCR and TSC , schematic of all three types ; STATCOM and FACTS devices

Voltage control of distribution systems: Tap changing, booster transformers, synchronous phase modifiers, induction regulators and static capacitors.

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
2) Modern power system analysis by D.P.Kothari & I.J.Nagrath McGraw Hill

3) Power System Analysis operation and control by Abhijit Chakrabarti & Sunita Halder, HI

Reference Books:

1) Economic operation of interconnected systems by L.K.Kirchmeyer
2) Power System Analysis by T.K.Nagsarkar M.S.Sukhija, OXFORD university press, 2007

3) Generation Distribution and utilization of Electrical Energy by CL Wadhwa, New Age Int. Pub , Revised 2/E

4) Electrical Energy Systems by John Weedy, Willey Eastern

EE413: UTILIZATION OF ELECTRICAL POWER

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit – I

Motor Power Rating and selection: General considerations in selecting motor power ratings - Selection of motor capacity for continuous duty - Equivalent current - torque and power methods - Selection of capacity for short time and intermittent periodic duty - Heating and cooling of motors - Load equalization - fly wheel and its applications in load equalization. Electric braking advantages - plugging - dynamic and regenerative braking applied to DC motors and Induction motors.

Unit – II

Electric Traction: Systems of electric traction - transmission of drive - mechanics of train movement, speed-time curves, effect of speed, acceleration and distance on schedule, Power and energy output from driving axles, specific energy output, series – parallel method of speed control shunt bridge transition – collectors - different types of electric braking - reverse current - dynamic and regenerative braking. Counter current braking and reversal of shunt motors.

Unit – III

Electric Heating: Elementary principles of heat transfer - Stefan's law - electric furnaces - resistance furnace - design of heating element - losses and efficiency - Construction and working of different types of induction furnaces - Dielectric heating - arc furnaces - control equipment. Electrolysis – Electroplating - Applications. **Welding:** Types of welding - resistance and arc welding - characteristics of Carbon and metallic arc welding - comparison (Excluding electronic controls)

Unit – IV

Illumination: Light production by excitation - Gas discharge lamps - Fluorescent lamps - Ultra violet lamps - Arc lamps - Filament lamps - Polar curves - Effect of voltage variation - Lighting calculations solid angle and square law methods of calculation - Factory lighting - flood lighting and street lighting.

Text Books:

1. Utilization Electric Energy by Openshaw Taylor, Orient Longman,1986
2. Utilization of Electric Power by R.K Rajput,Laxmi Publications (P) LTD

Reference Books:

1. Art and Science of Utilisation of Electrical Energy by Partab H Dhanpat Rai and Sons, New Delhi. Second edition
2. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta,
3. U. S. Bhatnagar and A. Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 2001.

EE414: SWITCH GEAR AND PROTECTIOIN

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

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

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.

Unit – III

Protection of alternators, transformers and transmission lines: Differential protection for generators, transformers and transmission lines - field suppression of alternator - over current and distance protection for feeders - Translay relay.**Grounding:**Neutral grounding - solid grounding - resistance and reactance grounding - Arc suppression coil.**Power System Earthing:** Objectives – definitions - tolerable limits of body currents - soil resistivity and earth resistance.

Unit – IV

Static 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.

Text Books:

1. Switch Gear Protection and Power System by Sunil S. Rao – Khanna Pub.
2. Fundamentals of Power System Protection by Y.G. Paithankar & S.R.Bhide, PHI, 2003

Reference Books:

1.Power System Protection and Switchgear by B.Ram – Tata Mc-Graw Hill Pub 2001
2. Power system protection Static relays by T.S. Madhava Rao TMH 2nd edition 1981
3. The Art and Science of protective relaying by Mason Wiley Eastern Ltd
4. Power system protection and switchgear by B. Ravindranath, Chander Willy Eastern Ltd 1992

EE-415(A) ELECTRICAL POWER DISTRIBUTION SYSTEMS ENGINEERING

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit – I

Distribution systems 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 - Use of monograms for obtaining 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. Electric Power Distribution system Engg. by Turan Gonen, MGH

2. Electrical distribution systems by Dr. V. Kamaraju, Right Publishers

REFERENCE BOOK:

1. Electric Power Distribution by A.S. Pabla, TMH, 4th Ed., 1997

EE-415(B) ENERGY CONSERVATION AND AUDIT

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit-I

System approach and End use approach to efficient use of Electricity - Electricity tariff types - Energy auditing: Types and objectives - audit instruments-ECO assessment and Economic methods-- specific energy analysis-Minimum energy paths-consumption models- Energy auditing of a typical industrial unit-case study.

Unit- II

Electric motors- Energy efficient controls and starting efficiency-Motor Efficiency and Load Analysis-Energy efficient / high efficient Motors-Case study; Load Matching and selection of motors. Variable speed drives; Pumps and Fans-Efficient Control strategies-optimal selection and sizing – Optimal operation and storage; Case study

Unit-III

Transformer Loading/Efficiency analysis - feeder/cable loss evaluation, case study.

Reactive power management-Capacitor Sizing-Degree of Compensation-Capacitor losses-Location-placement-Maintenance, case study; Peak Demand controls-Methodologies-Types of Industrial loads-Optimal Load scheduling-case study; Lighting-Energy efficient light sources-Energy conservation in Lighting Schemes-Electronic ballast-Power quality issues-Luminaries, case study;

Unit-IV

Cogeneration-Types and Schemes-Optimal operation of cogeneration plants-case study;

Electric loads of Air conditioning & Refrigeration-Energy conservation measures-Cold storage - Types – Optimal operation – case study; Electric water heating-Gysers-Solar Water Heaters - Power Consumption in Compressors - Energy conservation measures - Electrolytic Process; Computer Controls-softwares-EMS.

REFERENCE BOOKS:

1. Industrial Energy Management: Principles and Applications by Giovanni and Petrecca, The Kluwer international series-207 (1999)
2. Guide to Electric Load Management by Anthony J.Pansini, Kenneth D.Smalling, Pennwell pub (1988)
3. Energy-Efficient Electric Motors and their applications by Howard E.Jordan, Plenum pub corp; 2nd ed. (1994)
4. Energy Management Hand book by Turner, Wayne C, Lilburn, The Fairmont press, 2001
5. Handbook of Energy Audits by Albert Thumann, Fairmont Pr; 5th edition (1998)
6. Recommended practice for Energy Conservation and cost effective planning in Industrial facilities by IEEE Bronze book, IEEE Inc, USA
7. Plant Engineers and Managers Guide to Energy Conservation- 7th Ed. By Albert Thumann, P.W, TWI press Inc. Terre Haute
8. Energy Efficiency manual by Donald R.W, Energy Institute press
9. Art and Science of Utilization of Electrical Energy by Partab H, Dhanpat Rai & sons ,New Delhi
10. Electric Energy Utilization and Conservation by Tripathy S.C , TMH
11. Guide Book on promotion of sustainable energy consumption by NEDCAP

EE-415(C) PROCESS CONTROL AND INSTRUMENTATION

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

UNIT – I:PROCESS DYNAMICS - Process variables – Load variables – Dynamics of simple pressure, flow level and temperature process – interacting and non-interacting systems – continuous and batch process – self-regulation – Servo and Regulator operation - problems.**CONTROL ACTIONS AND CONTROLLERS-** Basic control actions – characteristics of two position, three position, Proportional,Single speed floating, Integral and Derivative control modes – PI, PD, PID control-modes – Problems

UNIT – II:TYPES OF CONTROLLERS-Pneumatic - Hydraulic and Electronic Controllers to realize various control actions.**CONTROLLER SETTINGS** Evaluation criteria – 1/4th decay ratio, IEA, ISE, ITAE - determination of optimum settings for mathematically described process using time response and frequency response.

UNIT – III:TUNING OF CONTROLLERS- Tuning process curve reaction method – continuous oscillation method – damped oscillation method – problems.**FINAL CONTROL ELEMENTS-** I/P Converter - P/I converter - pneumatic, electric and hydraulic actuators – valve positioner

UNIT – IV:CONTROL VALVES-Control valves – characteristic of control valves – valve body – Globe – Butterfly -Diaphragm - Ball valves – Control valve sizing – Cavitations - flashing - problems. **MULTILOOP CONTROL SYSTEM-** Feed forward control – Ratio control – Cascade control – Split range – Multivariable control and examples from distillation column and Boiler system.

TEXT BOOKS :

1. Chemical Process Control : An introduction to Theory and Practice – by Stephanopoulos, Prentice Hall, New Delhi, 1999.
2. Process Control – Harriott P. , TMH, 1991

REFERENCES:

1. Process Control, Third Edition – Liptak B.G., Chilton Book Company, Pennsylvania, 1995
2. Process control – by Pollard A., Heinemann Educational Books, London, 1971.
3. Automatic Process Control – by Eckman D.P. , Wiley Eastern Ltd., New Delhi, 1993.
4. Process Control – by Patranabis.
5. Process System Analysis and Control – Coughanowr, McGraw Hill, Singapore, 1991

EE 415(D) FUZZY LOGIC AND APPLICATIONS

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit-I:

Classical and fuzzy sets:Classical sets - operations - properties of classical sets - mapping of classical sets to the functions. Fuzzy sets-membership - uncertainty - fuzzy set operations - properties of fuzzy sets. Classical and fuzzy relations - Cartesian product - crisp relations – cardinality - operations and properties of crisp relations. Fuzzy relations -cardinality operations and properties of fuzzy relations. Non interacting fuzzy sets - Tolerance and equivalence relations.

Unit-II:

Membership functions - futures of membership functions – fuzzification - membership value assignments-intuition - ranking ordering - angular fuzzy sets - neural nets - genetic algorithms - inductive reasoning - Fuzzy-to-crisp conversions: Lambda-cuts for fuzzy sets - lambda-cuts for fuzzy relations – de fuzzification methods. Fuzzy arithmetic, numbers, vectors and extension principle: fuzzy members - approximate methods of extension-vertex method - DSW algorithm - restricted DSW algorithm - fuzzy vectors.

Unit- III:

Classical logic and fuzzy logic: Classical predicate logic-tautologies – contradictions - equivalence - exclusive or and exclusive nor - logical proofs - deductive inferences. Fuzzy logic - approximate reasoning - Fuzzy tautologies - contradictions - equivalence and logical proofs - other forms of the implication operation - other forms of the composite operation. Fuzzy rule-based systems: Natural language - linguistic Hedges – rule based systems - canonical rule forms - decomposition of compound rules - likelihood and truth qualification - aggregation of Fuzzy rules - Graphical techniques inference.

Unit-IV

Fuzzy decision making Fuzzy synthetic evaluation - fuzzy ordering - preference and consensus – Multi objective decision making - Fuzzy Bayesian Decision method - Decision making under Fuzzy states and fuzzy actions. Fuzzy classification: Classification by Equivalence Relations-crisp relations - Fuzzy relations. Cluster validity - C-Means clustering-Hard C-Means (HCM). Fuzzy C-Means (FCM) - classification Metric - Hardening the Fuzzy C-partition - similarity relations from clustering.

Text books:

1. Fuzzy logic with engineering applications by Timothy J. Ross, Mc Graw Hill, 97
2. Fizzy sets and Fuzzy logic by Klir and Ywan, Prentice hall of India
3. Neural Networks, Fuzzy logic and Genetic Algorithms by S. Rajasekharan & Y.A. Vijayalakshmi Pai, PHI

Reference Books:

1. Fuzzy - Neural Control: Principles, Algorithms and applications by Nie and Linkens, PHI.

Relationship of Course to Program Outcomes Electrical Engineering:

OPEN ELECTIVE
INTELLECTUAL PROPERTY RIGHTS, PATENT LAWS &ETHICAL ISSUES
BT 100

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Intellectual Property Rights: Introduction, forms of Intellectual property, international & regional agreements/ treaties in IPR; IPR related Legislations in India; IPR and Agricultural Technology- implications in India and other developing countries; GATT, TRIPS, and WIPO;

Other IPR issues: Trade Secrets, Copy Rights, Trade Marks and their legal implications; Farmer's Rights, Plant Breeder's rights; Traditional knowledge and their commercial exploitation and protection.

UNIT – II

Patents and Patent processing: Introduction, Essential requirements, Patent application, Procedures and granting, Patent search, PCT, UPOV, Patents in Biotechnology and controversies involved.

UNIT – III

Regulatory Affairs: Regulatory affairs: Indian contest- requirements and guidelines of GMP, understanding of Drugs and cosmetic act 1940 and rules 1945 with reference schedule M, U & Y. Related quality systems- objectives and guidelines of USFDA, WHO &ICH, Introduction to ISO series.

Documentation and Protocols: Documentation: Types related to pharmaceuticals industry, protocols, harmonizing formulation development for global fillings, NDA, ANDA, CTD, Dealing with post approval changes- SUPAC, handling and maintenance including electronic documentation.

UNIT – IV

Ethics: Research and ethical issues; Ethical issues in use of animals in research and testing; ethical issues in research involving human participants; Protecting Genetic Privacy; Gene testing – Pros & Cons. Human Cloning & Human Dignity – an ethical enquiry; Ethical, Legal and Social Issues (ELSI) concerning recent advancements in key areas of biotechnology- pre-natal diagnostics.

TEXTBOOKS:

1. Good manufacturing practices for pharmaceuticals, S.H.Willing
2. Protection of Industrial property Rights, P.Das&Gokul Das
3. Intellectual property rights on Biotechnology, Singh K, BCIL, New Delhi
4. Biotechnologies in developing countries present and future, Sasson A, UNESCO Publications.
5. Bioethics and Biosafety- M.K.Sateesh, I.K. International, New Delhi.

OPEN ELECTIVE
BIOINFORMATICS ALGORITHMS
BT 200

Lectures	:	3 Periods/Week, 1 Tutorial	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

INTRODUCTION: Algorithms and Complexity- Biological algorithms versus computer algorithms – The change problem –Correct versus Incorrect Algorithms – Recursive Algorithms – Iterative versus Recursive Algorithms – Big-O Notations– Algorithm Design Techniques.

GREEDY ALGORITHMS: Molecular Biology Primer – Exhaustive Search – Mapping Algorithms – Motif-Search Trees – Finding Motifs –Finding a Median String – Greedy Algorithm – Genome Rearrangements – Sorting by Reversals – Approximation Algorithms – A Greedy Approach to Motif Finding.

UNIT – II

DYNAMIC PROGRAMMING ALGORITHMS: DNA Sequence comparison – Manhattan Tourist Problem – Edit Distance and Alignments – Longest Commons Sub sequences – Global Sequence Alignment – Scoring Alignment – Local Sequence Alignment – Alignment with Gap Penalties – Multiple Alignment-Gene Predictions – Approaches to Gene Prediction – Spiced Alignment – Divide and Conquer Algorithms.

UNIT – III

GRAPH ALGORITHMS: Graphs – Graphs and Genetics – DNA Sequencing – Shortest Superstring Problem – DNA arrays as alternative sequencing techniques – Sequencing by Hybridization – Path Problems – Fragment assembly in
DNA Sequencing – Protein Sequencing and Identification – The Peptide Sequencing Problem – Spectrum Graphs – Spectral Convolution and Alignment – Combinatorial Patter matching.

UNIT – IV

CLUSTERING AND TREES: Clustering and trees – Gene expression analysis – Hierarchical clustering-k-means clustering – Clustering and corrupted Cliques – Evolutionary Trees – Distance-based tree reconstruction – Reconstruction trees from additive matrices – Evolutionary trees and hierarchical clustering – Character-based tree reconstruction – Small and large Parsimony Problem – Hidden Markov Models- Randomized Algorithms.

TEXTBOOKS:

1. Neil C. Jones and Pavel A. Pevzner, *An Introduction to Bioinformatics Algorithms*, MIT Press, FirstIndian Reprint 2005.
2. Gary Benson Roderic page (Eds), *Algorithms in Bioinformatics*, Springer International Edition, FirstIndian Reprint 2004.

REFERENCE BOOKS

1. Gusfields G, Algorithms on strings, trees and sequences- Computer Science and ComputationalBiology, Cambridge University Press 1997.
2. Steffen Schulze-Kremer, Molecular Bioinformatics: Algorithms and Applications, Walter de Gruyter, 1996.

OPEN ELECTIVE
INDUSTRIAL POLLUTION & CONTROL
ChE 100

Lectures	:	3 Periods/Week, 1 Tutorial	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Man & Environment, Types of Pollution, Pollution control aspects, Industrial emissions-Liquids, Gases, Environmental Legislation, Water quality management in India, Air (Prevention & Control of Pollution) Act.

UNIT – II

Removal of BOD, Biological oxidation, Anaerobic treatment, Removal of Chromium, Removal of Mercury, Removal of Ammonia, Urea, Treatment of Phenallic effluents.

UNIT – III

Removal of Particulate matter, Removal of Sulfur Oxides, Removal of Oxides of Nitrogen, Removal of Organic vapors from Effluent.

UNIT – IV

Pollution control in Chemical Industries, General considerations, pollution control aspects of Fertilizer industries, Pollution control in Petroleum Refineries and Petrochemical units, Pollution control in Pulp and Paper Industries.

TEXT BOOK:

1. Pollution control in Process Industries, S.P .Mahajan, Tata McGraw Hill Publishing Company Ltd, New Delhi

REFERENCE BOOKS:

1. Environmental Pollution Control Engineering, C.S.Rao, Wiley Eastern Ltd., New Age International Ltd.,
2. Air pollution, M.N.Rao, H.V.N.Rao, Tata McGrawhill.
3. Water Pollution control, W.Wesley Eckenfelder Jr.Industrial, Tata McGrawHill.

OPEN ELECTIVE
ENERGY ENGINEERING
ChE 200

Lectures	:	3 Periods/Week, 1 Tutorial	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Conventional energy resources, the present scenario, scope for future development.

Coal: Origin, occurrence and reserves, classification, ranking, analysis and testing, coal carbonization, manufacture of coke, coal gasification, coal liquefaction.

UNIT – II

Petroleum: Origin, occurrence and reserves, composition, classification, characteristics, exploration and production.

Petroleum Refining: Refinery processes, petroleum products, testing and analysis of petroleum products.

UNIT – III

Non conventional energy sources: Solar energy, solar radiation, principles of heating and cooling, photo voltaic cells.

Bio gas products, bio-mass, wind energy, hydrogen energy, geothermal and ocean thermal energy, fuel cells.

UNIT – IV

Energy storage, mechanical energy storage, water storage, solar pond, phase change storage, chemical storage.

Energy Conservation: Conservation methods in process industries, Theoretical analysis, practical limitations, equipment for energy saving / recovery.

TEXT BOOKS:

1. Conventional Energy technology, S.B.Pandy, Tata McGraw Hill
2. Fuel Science, Harker and Allen, Oliver & Boyd.
3. Energy conversion, Culp, Mc Graw Hill.

OPEN ELECTIVE
AIR POLLUTION AND CONTROL
CE 100

Lectures	:	3 Periods/Week, 1 Tutorial	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT –I

Air Pollution –Definitions, Air Pollutants–Classifications –Natural and Artificial– Primary and Secondary, point and Non-Point, Line and Areal Sources of air pollution-stationary and mobile sources.

Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

UNIT –II

Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomenon Air Quality-wind rose diagrams.

UNIT – III

Lapse Rates, Pressure Systems, Wind sand moisture plume behavior and plume Rise Models; Gaussian Model for Plume Dispersion.

Control of particulates –Control at Sources, Process Changes, Equipment modifications, Design and operation of control. Equipment's–Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

UNIT – IV

General Methods of Control of NOx and Sox emissions–In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

Air Quality Management–Monitoring of SPM, SO; NO and CO Emission Standards.

NOTE:

Two questions of 12 marks each will be given from each unit out of which one is to be answered. Twelve questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXTBOOKS:

1.Air pollution By M.N.Raoand H.V.N.Rao –Tata Mc.GrawHillCompany.
2.Air pollution by Warkand Warner.-Harper&Row,NewYork.

REFERENCE BOOK:

1.An introductiontoAirpollution by R.K.Trivedy andP.K.Goel,B.S.Publications.

OPEN ELECTIVE
REMOTE SENSING AND GIS
CE 200

Lectures	:	3 Periods/Week, 1 Tutorial	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Concepts and Foundations of Remote Sensing: Introduction, Energy sources and radiation principles, Energy interactions in the atmosphere, Energy interactions with Earth surface features, an ideal remote sensing system, characteristics of remote sensing systems, application of remote sensing .

UNIT – II

Visual Image Interpretation: Introduction, Fundamentals of visual image interpretation, basic visual image interpretation equipment, land use and land cover mapping, geologic and soil mapping, agricultural applications, forestry applications, water resources applications, urban and regional planning applications.

UNIT – III

Digital Image Processing: Introduction, Image rectification and restoration, Image enhancement, contrast manipulation, spatial feature manipulation, Image Classification, Supervised classification, the classification stage, the training stage, Un-supervised classification, Classification accuracy assessment.

UNIT – IV

Geo-graphical Information Systems (GIS):Introduction, spatial information system: an overview, conceptual model of spatial information, concept of databases, digitizing, editing, and structuring map data, data quality and sources of errors in GIS, spatial data analysis (vector based), spatial data analysis (raster based), Fundamental concepts of GPS, Types of GPS, GPS satellite, Application of GPS in resource surveys, mapping and navigation.

TEXT BOOKS:

1. Lillisand.T.M, Keifer.R.W, and Chipman.J.WRemotesensind Image interpretation, 2004, John Wlley and Sons.
2. Chrisman, N.R. (1997), Exploring Geographic Information systems, John Willey and sons
3. Remote Sensing and its applications by LRA Narayana University Press 1999.
4. Principals of Geo physical Information Systems - Peter ABurragh and Rachael A. Me Donnell, Oxford Publishers 2004.

REFERENCE BOOKS:

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU Hyderabad 2001,
3. B.S.Publications.GIS by Kang - tsungchang, TMH Publications & Co.
4. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
5. Fundamental of GIS by Mechanical designs John Wiley & Sons.

OPEN ELECTIVE
DATABASE MANAGEMENT SYSTEMS
CS 100

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

(17 Periods)

Databases and Database Users: Introduction - An Example - Characteristics of the Database Approach - Actors on the Scene - Workers behind the Scene - Advantages of Using the DBMS Approach - A Brief History of Database Applications - When Not to Use a DBMS.

Database System Concepts and Architecture: Data Models, Schemas, and Instances - Three-Schema Architecture and Data Independence - Database Languages and Interfaces - The Database System Environment - Centralized and Client/Server Architectures for DBMSs - Classification of Database Management Systems.

Data Modeling Using the Entity-Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design - An Example Database Application - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types - Refining the ER Design for the COMPANY Database - ER Diagrams, Naming Conventions, and Design Issues.

UNIT – II

(15 Periods)

The Relational Data Model and Relational Database Constraints: Relational Model Concepts - Relational Model Constraints and Relational Database Schemas - Update Operations, Transactions, and Dealing with Constraint Violations - Relational Database Design Using ER-to-Relational Mapping.

SQL-99: Schema Definition, Constraints, Queries, and Views: SQL Data Definition and Data Types - Specifying Constraints in SQL - Schema Change Statements in SQL - Basic Queries in SQL - More Complex SQL Queries - INSERT, DELETE, and UPDATE Statements in SQL - Views (Virtual Tables) in SQL.

UNIT – III

(16 Periods)

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas - Functional Dependencies - Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

Relational Database Design Algorithms and Further Dependencies: Properties of Relational Decompositions - Algorithms for Relational Database Schema Design –

Multivalued Dependencies and Fourth Normal Form - Join Dependencies and Fifth Normal Form.

UNIT – IV

(16 Periods)

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing - Transaction and System Concepts - Desirable Properties of Transactions - Characterizing Schedules Based on Recoverability - Characterizing Schedules Based on serializability.

Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control - Concurrency Control Based on Timestamp Ordering – Multiversion Concurrency Control Techniques - Validation (Optimistic) Concurrency Control Techniques - Granularity of Data Items and Multiple Granularity Locking.

TEXT BOOK:

1. "Fundamentals of Database Systems", RamezElmasri and Navate Pearson Education, 5th edition.

REFERENCE BOOKS:

1. "Introduction to Database Systems", C.J.Date Pearson Education.
2. "Data Base Management Systems", Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rdEdition.
3. "Data base System Concepts", Silberschatz, Korth, McGraw hill, 5th edition.

OPEN ELECTIVE
JAVA PROGRAMMING
CS 200

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT - I

(16 Periods)

Introduction: Introduction to java, data types, dynamic initialization, scope and life time, operators, control statements, arrays, type conversion and casting, finals & blank finals.

Classes and Objects : Concepts, methods, constructors, usage of static, access control, this key word, garbage collection, overloading, parameter passing mechanisms, nested classes and inner classes.

Inheritance: Basic concepts, access specifires, usage of super key word, method overriding, final methods and classes, abstract classes, dynamic method dispatch, Object class.

Interfaces: Differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces.

Packages: Creating a Package, setting CLASSPATH, Access control protection, importing packages.

Strings: Exploring the String class, String buffer class, Command-line arguments.

UNIT – II

(15 Periods)

Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes.

Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, Thread class, Runnable interface, creating multiplethreads, Synchronization, thread priorities.

Applets: Concepts of Applets, life cycle of an applet, creating applets, passing parameters to applets, accessing remote applet, Color class and Graphics

UNIT-III

(16 Periods)

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling events.

AWT: AWT Components, windows, canvas, panel, File Dialog boxes, Layout Managers, Event handling model of AWT, Adapter classes, Menu, Menubar.

UNIT-IV

(17 Periods)

Swing-I – swings introduction, JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons.

JDBC Connectivity: Jdbc connectivity, types of Jdbc Drivers, connecting to the database, Jdbc Statements, Jdbc Exceptions, Manipulations on the database, Metadata.

TEXT BOOKS:

1. "The Complete Reference Java J2SE", 7th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi.
2. "Big Java", 2nd Edition, Cay Horstmann, John Wiley and Sons, Pearson Education.

REFERENCE BOOKS:

1. "Java How to Program", Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
2. "Core Java 2", Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
3. "Core Java 2", Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
4. "Beginning in Java 2", Iver Horton, Wrox Publications.
5. "Java", Somasundaram, Jaico.
6. "Introduction to Java programming", By Y.DanielLiang, Pearson Publication.

OPEN ELECTIVE
OPTIMIZATION TECHNIQUES
EE 100

Lectures	:	3 Periods/Week, 1 Tutorial	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Linear Programming: Introduction and formulation of models – Convexity - simplex method - Bid method - two phase method – degeneracy – nonexistent and unbounded solutions - duality in L.P. - dual simplex method - sensitivity analysis - revised simplex method - transportation and assignment problems.

UNIT – II

Non-linear Programming: Classical optimization methods - equality and inequality constraints - Lagrange multipliers and Kuhn-Tucker conditions - quadratic forms - quadratic programming and Bessel's method.

UNIT – III

Search Methods: One dimensional optimization - sequential search - Fibonacci search - multi dimensional search method - Univariate search - gradient methods - steepest descent / ascent methods - conjugate gradient method -Fletcher – Reeves method - penalty function approach.

UNIT – IV

Dynamic Programming: Principle of optimality recursive relation - solution of linear programming problem - simple examples

TEXT BOOKS:

1. Engineering Optimization: Theory and Practice by S.S. Rao, 3rd Ed., New Age International, 1998
2. Optimization Methods in Operations Research and Systems Analysis by K.V. Mittal and C. Mohan, 3rd Ed, New Age International, 1996.

REFERENCE BOOKS:

1. Non-linear Programming by P.L. Mangassarian.
2. Operations Research by S.D. Sharma.
3. Operations Research: An introduction by H.A. Taha, 6th Edition, PHI.
4. Linear Programming by G. Hadley.

OPEN ELECTIVE
NON-CONVENTIONAL ENERGY SOURCES
EE 200

Lectures	:	3 Periods/Week, 1 Tutorial	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Principle of Renewable Energy: Comparison of renewable and conventional energy sources - Ultimate energy sources - natural energy currents on earth - primary supply to end use - Spaghetti & Pie diagrams - energy planning - energy efficiency and management.

UNIT – II

Solar Radiation: Extra terrestrial solar radiation - terrestrial solar radiation - solar thermal conversion - solar thermal central receiver systems - photovoltaic energy conversion - solar cells – 4 models.

UNIT – III

Wind energy: Planetary and local winds - vertical axis and horizontal axis wind mills - principles of wind power - maximum power - actual power - wind turbine operation - electrical generator.

UNIT – IV

Energy from Oceans: Ocean temperature differences - principles of OTEC plant operations - wave energy - devices for energy extraction – tides - simple single pool tidal system.
Geothermal energy: Origin and types - Bio fuels – classification - direct combustion for heat and electricity generator - anaerotic digestion for biogas - biogas digester - power generation.

TEXT BOOK:

1. Renewable Energy Sources by John Twidell& Toney Weir : E&F.N. Spon.

REFERENCE BOOKS:

1. Power plant technology by EL-Wakil, McGraw-Hill.
2. Non-Conventional Energy Sources by G.D.Rai, Khanna Pub.

OPEN ELECTIVE
CONSUMER ELECTRONICS
EC 100

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Microphones, Headphones and Headsets, Loud Speakers, Disc Recording and Reproduction, Amplifying Systems Equalizers and Mixers, Electronic Music Synthesizers.

UNIT – II

Commercial Sound, Theatre Sound System, Audio Systems , Color TV standards and Systems, Remote Controls, Video Systems.

UNIT – III

Electronic Gadgets and Home Appliances:
Telecommunication Systems, Switching Systems, Modulation Techniques, Carrier Systems, Fibre Optics

UNIT – IV

Data Services, Mobile Systems, Facsimile fax, Xerography

TEXT BOOK:

1.Consumer Electronics by S.P.Bali, Pearson Education, ISBN: 9788131717592.

REFERENCE BOOKS:

1. Consumer Electronics for Engineers by Philip Herbert Hoff, Cambridge University Press (July 28, 1998), **ISBN-10:** 0521582075
2. Digital Consumer Electronics Handbook by RonadlK.Jurgen, (Editor) by McGraw Hill Professional Publishing, 1997. **ISBN-10:** 0070341435.

OPEN ELECTIVE
EMBEDDED SYSTEMS
EC 200

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Introduction to embedded systems, design challenges, processor technology, IC technology, design technology, tradeoffs, single purpose processor, RT level combinational logic, sequential logic (RT level) custom single purpose processor design, optimizing custom single purpose processors. General purpose processors: basic architecture, pipelining, programmers view, development environment, ASIPS, microcontrollers and digital signal processors

UNIT – II

State machine and concurrent process models: models vs. languages, FSMD, using state machines, PSMM, concurrent process model, concurrent processes, communication and synchronization among processes, data flow model and real time systems. Need for communication interfaces, RS232/UART, RS422/RS485, USB, Infrared, IEEE 802.11, and Bluetooth.

UNIT – III

Embedded system and RTOS concepts: Architecture of kernel, tasks and task scheduler, interrupt service routines, semaphores, mutex. Mail boxes, message queues, event registers, pipes and signals.

UNIT – IV

Embedded system and RTOS concepts: Timers, memory management, priority inversion problem, embedded OS and real time OS, RT Linux, and Handheld OS. Design technology: Introduction, automation, synthesis, parallel evolution of compilation and synthesis, logic synthesis, RT synthesis, behavioural synthesis, system synthesis, HW / SW co- design, verification, and co-simulation.

TEXT BOOKS:

1. Frank Vahid, Tony D Givargis, Embedded system design – A unified HW/ SW Introduction, John Wily & sons, 2002.
2. KVKK Prasad, Embedded and real time systems, Dreemtech Press, 2005.

REFERENCE BOOKS:

1. Raj Kamal, Embedded system architecture, programming and design, TMH edition.
2. Mohammad Ali Mazidi, Janice G., The 8051 microcontroller and embedded systems, Pearson edition.
3. Jonathan W Valvano, Embedded Microcomputer Systems, Brooks/cole, Thompson Learning.
4. David E. Simon, An Embedded Software Primer, Pearson edition.

OPEN ELECTIVE
VIRTUAL INSTRUMENTATION USING LABVIEW
EI 100

Lectures	:	3 Periods/Week, 1 Tutorial	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

REVIEW OF VIRTUAL INSTRUMENTATION: Historical perspective, Need of VI, Advantages of VI, Define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming.

PROGRAMMING TECHNIQUES: VIS and sub-VIS, loops & charts, arrays, clusters, graphs, case & sequence structures, formula modes, local and global variable, string & file input. Graphical programming in data flow, comparison with conventional programming.

UNIT – II

DATA ACQUISITION BASICS: ADC, DAC, DIO, Counters & timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation. GPIB/IEEE 488 concepts, and embedded system buses - PCI, EISA, CPCI, and USB & VXI. A

UNIT – III

COMMON INSTRUMENT INTERFACES: Current loop, RS 232C/RS 485, GPIB, System basics, interface basics: USB, PCMCIA, VXI, SCXI, PXI etc, networking basics for office & industrial application VISA & IVI, image acquisition & processing, Motion Control. ADC, DAC, DIO, DMM, waveform generator.

UNIT – IV

USE OF ANALYSIS TOOLS AND APPLICATION OF VI: Fourier transforms Power spectrum, Correlation methods, windowing & flittering. Application in Process Control projects, Major equipments- Oscilloscope, Digital Multimeter, Pentium Computers, temperature data acquisition system, motion control employing stepper motor.

TEXT BOOKS:

1. Gary Johnson, LABVIEW Graphical Programming , 2nd Edition, McGraw Hill, 1997.
2. Lisa K. Wells and Jeffrey Travis, LABVIEW for Everyone , PHI, 1997.
3. Skolkoff, Basic concepts of LABVIEW 4 , PHI, 1998.

REFERENCE BOOKS:

1. S. Gupta, J.P. Gupta, *PC Interfacing for Data Acquisition and Process Control,* ISA, 2nd Edition, 1994.
2. Technical Manuals for *DAS Modules of Advantech* and National Instruments.
3. L.T. Amy, *Automation System for Control and Data Acquisition*, ISA, 1992.

OPEN ELECTIVE
SENSORS and TRANSDUCERS
EI 200

Lectures	:	3 Periods/Week, 1 Tutorial	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Introduction: Definition related to measurements /instrumentation, static and dynamic characteristics of instruments, classification of transducers.

UNIT – II

Displacement Measurement: Variable resistance devices, variable inductance devices, variable capacitance devices, digital displacement transducers.

Strain measurement: Stress-strain relations, resistance strain gauges, types of strain gauges, strain gauge measurement techniques, static measurements ,dynamic measurements. Calibration of strain gauge, strain gauge load cell, force and torque measurements using strain gauge.

UNIT – III

Pressure measurement: Diaphragm, Bellows, Bourdon tubes, Resistive inductive and capacitive transducers, piezo-electric transducers.

Low pressure measurement: McLeod gauge, Knudson gauge, Ionization gauge.

Temperature measurement: RTD, Thermocouple and thermistor.

UNIT – IV

Flow measurement: Head type flow meters, Rotometer, Electromagnetic flow meter.

Measurement of liquid level, viscocity, humidity and moisture.

TEXT BOOKS:

1. A.K.Ghosh, Introduction to Instrumentation and Control, PHI.
2. BC Nakra, KK Chaudhry, Instrumentation measurement and analysis, TMH, New Delhi second edition.

REFERENCE BOOKS:

1. PatranabisD,"Sensors and transducers", second edition, PHI, New Delhi 2003.

Ernest O Doeblin, "Measurement Systems Application and Design", TMH.

OPEN ELECTIVE
MOBILE APPLICATION DEVELOPMENT
IT 100

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Introduction: Introduction to java, data types, dynamic initialization, scope and life time, operators, control statements, arrays, type conversion and casting, finals & blank finals.

Classes and Objects : Concepts, methods, constructors, usage of static, access control, this key word, garbage collection, overloading, parameter passing mechanisms, nested classes and inner classes.

Inheritance: Basic concepts, access specifiers, usage of super key word, method overriding, final methods and classes, abstract classes, dynamic method dispatch, Object class.

Interfaces: Differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces.

UNIT – II

Packages: Creating a Package, setting CLASSPATH, Access control protection, importing packages.

Strings: Exploring the String class.

Library: Date class, Collection, Enumerations and Wrapper classes.

Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes.

I/O Streams: Streams, Byte streams, Character streams, File class, File streams.

UNIT – III

Introduction to Mobile Application Development, Constraints and requirements of mobile Apps, Understanding the available mobile platforms

Overview of Android: Introduction to Android OS, History of Android, Versions of Android, Android Architecture.

Understanding the development Environment: Developing Android applications using Eclipse, creating the first Android application, Anatomy of the Android Application, Working with the emulators.

Application Components: Activities, Services, Content Providers, Broadcast Receivers, Understanding Activity, Activity's Life Cycle and Intents.

Creating UI for Android: Android Views and View Groups, Android Layouts, Basic Views, Picker views, List views, Additional views (Image Views, Gallery view and Image Switcher) and working with menus. Understanding and working with screen Orientation.

UNIT – IV

Data Persistence: Shared Preferences, Working with Files, Working with databases (SQLite).
Content Providers: Accessing the Contacts using Content Providers.
Messaging & Networking: Sending SMS, Sending e-mails, Checking for the availability of the network, Downloading binary data from Internet, Downloading images from Internet, Working with XML and consuming web services.
Working with Sensors: Motion & Proximity sensors
Working with Location: Obtaining the location of mobile using GPS and A-GPS, Displaying the Location on Maps.
Camera: Working with camera
Services and Broadcast Receivers: Working with Services and broadcast receivers.
Publishing Apps: Preparing for publishing and deploying the APK file.

TEXT BOOK:

1. "The Complete Reference Java J2SE", 7th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi (for UNIT – I)

2. Beginning Android application development, Wei-Meng Lee, Wiley Publishing Inc.(for UNIT – II)

REFERENCE BOOKS:

1. "Java How to Program", Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
2. Learn JAVA for Android Development, Jeff Friesen, Apress Publications.

OPEN ELECTIVE
.NET TECHNOLOGIES
IT 200

Lectures	:	3 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Introduction to C# 2.0, Expressions and control structures, Strings and regular expressions, Arrays and collections, Object-oriented programming in C#, Introduction to generics, I/O and persistence, Working with XML, Events and delegates, Multithreaded programming, Reflection fundamentals

UNIT – II

Assemblies and App Domains, COM and windows interoperability, Code access security, Cryptography and data protection, Optimizing your .NET 2.0 code, ADO.NET fundamentals, Advanced ADO.NET techniques, Working with ADO.NET data providers, Programming with SQL Server 2005.

UNIT – III

HTML, Introduction to ASP.NET 2.0 and Web forms, ASP.NET Web Controls, State management in ASP-NET 2.0, Using master pages, ASP.NET personalization and customization, Building rich, database-driven Web applications, Securing your ASP.NET applications, Exposing functionality with Web services.

UNIT – IV

Introduction to Windows Forms 2.0, The Windows Forms control library, advanced user, interface programming, Data binding with Windows Forms 2.0, Remoting

TEXT BOOK:

1. Microsoft Visual C# 2005 Unleashed by Kevin Hoffman, Sams (Pearson India), 2006.

REFERENCE BOOKS :

1. Core C# and .NET by Stephen C.Pary, Prentice Hall (Pearson Education), 2006.
2. C#: The complete reference by Herbert Schildt, Tata McGraw Hill, 2006 2/e.
3. Pro C# 2005 and the .NET Platform by Andrew Troelson, Apless 2005 3/e.

OPEN ELECTIVE
ROBOTICS
ME 100

Lectures	:	3 Periods/Week, 1 Tutorial	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Introduction to Robotics, major components of a robot, robotic like devices, classification of robots – Classification by coordinate system and by control method, Specifications of robots, fixed versus flexible automation, economic analysis, overview of robot application.

UNIT – II

Robot end Effectors: Introduction, end effectors, interfacing, types of end effectors, grippers and tools, considerations in the selection and design of remote centered devices.

UNIT – III

Robotic sensory devices: Objective, Non-optical position sensors – potentiometers, synchros, inductocyn, optical position sensors – optic interrupters, optical encoders (absolute & incremental).

Proximity sensors: Contact type, non contact type – reflected light scanning laser sensors.

Touch & slip sensors: Touch sensors – proximity rod & photo detector sensors, slip sensors – Forced oscillation slip sensor, interrupted type slip sensors, force and torque sensors.

UNIT – IV

Transformations and Kinematics: Objectives, homogenous coordinates, basic transformation operations, forward solution – DenavitHartenberg procedure. Simple problems involving planar manipulators, inverse or backward solution – problems involved, techniques.

Introduction to Trajectory Planning, the manipulator jacobian.

TEXT BOOKS:

1. Robotic Engineering by Richard D.Klafter.
2. Industrial Robotics by MikellP.Groover.

REFERENCE BOOKS:

1. Introduction to Robotics – John J.Craig.
2. Robotics – K.S.Fu, Gonzalez & Lee.
3. Robotics for Enginers by YoramKoren.
4. Robotics Technology and Flexible Automation by S.R.Deb.
5. Robotics by Saeed.B.Niku.

OPEN ELECTIVE
POWER PLANT ENGINEERING
ME 200

Lectures	:	3 Periods/Week, 1 Tutorial	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

INTRODUCTION: Various Energy sources, types of power plants.

HYDRO ELECTRIC POWER PLANT: Hydrology, Rainfall, Run off and their measurement, hydrograph, Flow duration curve, Mass curve and calculation of storage capacity, site selection of hydro plant, different types of hydro plants.

DIESEL AND GAS TURBINE POWER PLANTS: Classification, main components of plant, plant layout, application and comparison with other plants.

UNIT – II

THERMAL POWER PLANT: General layout, Fuels, Coal analysis, Coal handling, burning of coal - stoker and pulverized systems, Ash handling systems, ESP, Need for Draught, High-pressure boilers, Condensers, cooling ponds and towers (wet and dry types), Deaeration.

UNIT – III

NUCLEAR POWER PLANTS: Nuclear Fission, Nuclear Fuels, Components of Reactor, types of Nuclear Reactors, Breeding, Fast Breeder Reactor, Radiation shields, nuclear waste disposal.

FLUCTUATING LOADS ON POWER PLANTS: Various performance Factors (load factor, diversity factor, use factor etc.).

POWER PLANT ECONOMICS: Fixed costs, operating costs, cost per kWh, comparison of fixed and operating costs of hydro, thermal, nuclear plants, power tariffs.

POLLUTION AND CONTROL: Introduction, particulate and gaseous pollutants, thermal pollution and solid waste pollution, methods to control pollution - brief description.

UNIT – IV

SOLAR ENERGY: Solar collectors, solar energy storage, solar ponds, solar energy utilization and applications.

POWER: Basic principle, different types of wind mills, wind energy conversion systems, other applications.**GEOTHERMAL POWER:** sources, energy conversion system. **OTEC:** ocean thermal energy conversion systems, introduction to tidal power.

DIRECT ENERGY CONVERSION SYSTEMS: Fuel cells, MHD, Solar cell.

TEXT BOOKS:

1. Power Plant Engineering - G.R. Nagpal, Khanna publ, New Delhi
2. Power Plant Engineering –P.K.Nag, TMH
3. Non Conventional Energy Sources - G.D. Rai, Khanna publ, New Delhi.

REFERENCE BOOKS:

1. Power Plant Technology - M.M. El Wakil, MGH, New York.
2. Principles of Energy Conversion - A.W.Culp, MGH, New York.

OPEN ELECTIVE
AUTOMATION TECHNOLOGY
BR 100

Lectures	:	3 Periods/Week, 1 Tutorial	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT-I

FUNDAMENTAL PRINCIPLES

Industrial prime movers - A brief system comparison: An electrical system, A hydraulic system, A pneumatic system, A comparison - Definition of terms: Mass and force, Pressure, Work, energy and power, Torque - Pascal's law - Gas laws.

HYDRAULIC PUMPS AND PRESSURE REGULATION

Pressure regulation - Pump types: Gear pumps, Vane pumps - Loading valves - Filters.

AIR COMPRESSORS, AIR TREATMENT AND PRESSURE REGULATION

Piston compressors - Air receivers and compressor control - Stages of air treatment - Pressure regulation: Relief valves, Non-relieving pressure regulators and Relieving pressure regulators - Service units.

UNIT -II

CONTROL VALVES

Graphic symbols - Types of control valve: Poppet valves, Spool valves, Rotary valves - Pilot-operated valves - Check valves: Pilot-operated check valves, Restriction check valves - Shuttle and fast exhaust valves - Sequence valves - Time delay valves

ACTUATORS

Linear actuators - Mounting arrangements and Cylinder dynamics - Seals - Rotary actuators: Constructional details - Applications: Speed control, Actuator synchronization, Regeneration, Counter balance and dynamic braking, Pilot-operated check valves, Pre-fill and compression relief.

UNIT-III

SENSORS

Sensors and Transducers - Performance Terminology – Sensors: Displacement, Position, and Proximity - Velocity and Motion - Force - Fluid Pressure - Liquid Flow - Liquid level - Temperature - Light Sensors - Selection of Sensors - Inputting data by switches.

UNIT-IV

PROGRAMMABLE LOGIC CONTROLLER

Programmable - Basic PLC structure - Input / Output Processing - Ladder Programming - Instruction lists - Latching and internal relays - Sequencing - Timers and Counters - Shift registers - Master and Jump Controls - Data Handling - Analog input / output.

MECHATRONIC SYSTEMS: Mechatronic designs, Case studies: Timed switch, A pick-and-place robot and Car park barriers.

Text Books:

1. Andrew Parr, Hydraulics and Pneumatics - A Technician's and Engineer's Guide, Jaico Publishing House, 2005

2. W. Bolton, Mechatronics, Fourth Edition, Pearson Education, 2010

Reference Books:

1. Anthony Esposito, Fluid Power with Applications, Fifth Edition, Pearson Education, 2005
2. W. Bolton, Pneumatic and Hydraulic Systems, Butterworth Heinemann, 1997
3. Ernest. O. Doebelin, Measurement Systems - Applications and Design, Fifth Edition, TMH
4. Gary Dunning, Introduction to Programmable Logic Controllers, 3rd Edition, 2007

TERM PAPER
EE451

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

It is aimed as a precursor to the project work done in the second semester of the final year B.Tech. It should help the students to identify their Research area/topic and should form the groundwork and preliminary research required for the project work. The batches formed for pursuing the project work in the final year shall select some research article published in the latest journals of IEEE, SPRINGER and other related journals. Each batch should refer to a minimum of FIVE reference sources outside their prescribed textbooks. The batch must gain an understanding of the research tools used and the related material, available both in printed and digital formats. Each project batch must make the presentation for two rounds on the same research article about their understanding, conclusion and if possible propose the extensions for the work. Each individual of the batch must give the presentation in both the rounds.

At the end of the semester, the batch must submit a report in IEEE format, on the work they have pursued throughout the semester containing

1. The aim and objective of the study.
2. The Rationale behind the study.
3. The work already done in the field and identified.
4. Hypothesis, experimentation and discussion.
5. Conclusion and further work possible.
6. Appendices consisting of illustrations, Tables, Graphs etc.,

Evaluation is to be done for the two presentations made and the report submitted. Method of Continuous Assessment (CA):

1. Day to day work - 10 marks
2. Seminar – I - 10 marks
3. Term Paper Report - 10 marks
4. Seminar – II - 10 marks

TOTAL 40 marks

Final Examination (FE) shall be conducted for 60 marks by one internal and one external examiner appointed by the principal. The FE contains Viva-voce and the demonstration of the model developed or work performed as a part of the term paper.

Lectures	3 Periods/ Week	Continuous Assessment	40
Final Exam	3 Hours	Final Exam. Marks	60

EE452: POWER ELECTRONICS LAB

LIST OF EXPERIMENTS:

1. Static characteristics of SCR, Triac
2. Characteristics of MOSFET & IGBT
3. Gate triggering methods for SCR's (R, R-C, UJT)
4. Single phase fully controlled rectifier with R, RL & RLE load (with or without feedback diode)
5. Characteristics of Jone's chopper
6. Voltage commutated DC chopper
7. Characteristics of single – phase modified series inverter
8. Characteristics of single - phase parallel inverter with R & RL loads
9. Characteristics of single - phase cyclo-converter (Center tapped or Bridge)
10. Study of single - phase full wave McMurray Bedford inverter
11. Single phase dual converter with R & RL loads (Circulating and non circulating modes)
12. Three phase fully/half controlled rectifier with R, RL and RLE loads
13. Speed control of Universal motor
14. Characteristics of PWM converter
15. Characteristics of Morgan's chopper
16. Characteristics of PWM inverter
17. Converter based DC motor control
18. Inverter based Induction motor control

Note: Minimum 10 experiments should be conducted.

Lectures	3 Periods/ Week	Continuous Assessment	40
Final Exam	3 Hours	Final Exam. Marks	60

EE 453 COMPUTER SIMULATION OF ELECTRICAL SYSTEMS LAB

LIST OF EXPERIMENTS:

1. Simulation of a single-phase full-bridge converter with different loads
2. Simulation of static characteristics of SCR
3. Simulation of a resonant pulse commutation circuit and buck chopper
4. Simulation of an AC voltage controller with various loads
5. Simulation of single-phase inverter with PWM control
6. Modeling of transformer
7. Transfer function analysis of a given circuit
8. State model representation of transfer functions
9. Plotting of Bode, Nyquist and root-locus plots for transfer functions
10. Steady state and Transient analysis of RLC circuits
11. Short circuit studies in power systems
12. Transient stability analysis of power systems
13. Relay co-ordination in power systems
14. Simulation of two area system

Note: Minimum 10 experiments should be conducted.

EE421: INDUSTRILAL DRIVES

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

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 and **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.

Text Books:

1. Fundamentals of Electric drives by G.K. Dubey, Narosa, 2001.

2. Power Electronics, circuits, devices and applications by M.H.Rashid PHI 3rd edition

Reference Books:

1.. Electric Motor Drive Modeling, Analysis and Control by R.Krishnan, PHI (p) limited
2. Power Semiconductor controlled drives by G.K. Dubey , PH,1989

3. Power semiconductor drives by S.B. Dewan, G.R. Selmon & Straughen ,John Wiley, 1984
4. Power Electronics by PC Sen, Tata MC Graw-Hill publishing Company Limited.

EE 422: COMPUTER AIDED POWER SYSTEM ANALYSIS

Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit – I:Incidence & Network Matrices: 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:Algorithm for formation of network matrices & short circuit studies: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 calculations for symmetrical and unsymmetrical faults using bus impedance matrix. Data preparation for short circuit program

Unit – III:**Formulation of Load Flow Problem**: Introduction – non linear equations - solution techniques using Gauss iterative, Gauss Seidal and Newton Raphson (rectangular and polar) methods using bus admittance matrix - acceleration of convergence - development of flow charts for load flow problems - comparison of different load flow methods. Data preparation for load flow program

Unit – IV:**Formulation of Transient Stability Problem:** Representing synchronous machine by constant voltage behind transient reactance (d- axis) and network by steady state equations - alternating solution approach for transient stability solving algebraic equations and differential equations alternately - numerical stability aspects of different integration schemes - combined solution approach. 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. Computer methods in Power System Analysis by Stagg, G.W. & El-Abiad TMH
2. Computer Techniques in Power System Analysis by M.A. Pai , TMH 2005

Reference Books:

1. Electric Energy systems Theory – by O.I.Elgerd, Tata Mc Graw-hill Publishing Comapany Ltd., Second edition 1983
2. Control and stability of Power Systems by Anderson & Fouad, Iowa state university press
3. Modern power system analysis by Nagrath & Kothari 3rd edition 2004
4. Transient stability of power systems : Theory and practice by M.Pavella & P.G.Murthy, John wiley & sons, 1994

EE423(A): HIGH VOLTAGE ENGINEERING

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit-I

GENERATION OF IMPULSE VOLTAGES:

Standard specifications - standard wave shapes for testing - properties of double exponential wave shapes - approximate estimate of wave shape control resistors - Multistage impulse generator - Energy of impulse generator.

GENERATION OF IMPULSE CURRENTS:

Standard specifications - analysis of impulse current generator.

GENERATION OF HIGH D.C AND A.C VOLTAGES:

Principle of Voltage Doubler circuit - Cockcroft-Walton cascade arrangement and its Mathematical analysis - cascade connection of transformers - Resonant transformers - Tesla coil.

U**nit-II**

MEASUREMENT OF HIGH VOLTAGES:

General concepts of High voltage measurements - voltage Dividers (Resistive, Inductive and Capacitive) for impulse measurement. High speed Oscilloscope - peak voltmeter and Sphere gap. Use of fibre optics in H.V measurement of high voltage DC - Layout of high voltage lab.

Unit-III

CORONA: Corona - factors affecting corona - critical voltages and power loss - Radio interference due to Corona.

HIGH VOLTAGE TESTING TECHNIQUES:

Testing of insulators – Bushings - isolators and CB's - Testing of transformers, Fault detection using Wavelets-theoretical aspects.

Unit-IV

NUMERICAL METHODS FOR ELECTRICAL FIELD COMPUTATION:

Finite difference method - Finite element method - charges simulation methods - Boundary element methods.

TEXT BOOKS:

1. High Voltage Engineering by M.S.Naidu and V.Kamaraju – TMH.
2. High Voltage Engineering fundamentals by Kuffel and Zungel, Elsavier Publications
3. High voltage Engineering by CL Wadhwa

REFERENCES:

1. Fundamentals of Gaseous Ionization and plasma Electronics by Essam Nasser – Wiley - Inter Science.
2. High Voltage Technology by ALSTOM
3. High Voltage and Electrical Insulation engineering by R Arora, W Mosch John Wiley - 2011

EE 423(B): ELECTRICAL MACHINE DESIGN

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

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 inter pole and commutator.

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.

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 Course in Electrical machine Design by A.K. Sawhney ,Dhanpatrai & Sons,
2. Performance and Design of AC Machines by M.G. Say
3. Performance and Design of AC Machines by A.E. clayton
4. Computer aided design of electrical equipment by M. Ramamoothy

REFERENCE BOOKS:

1. CEDT Manual on design and technology on low power transformers and inductors by IISC, Bangalore.
2. Design of Electrical Machines by V.N.Mittle

EE 423(C): EMBEDDED SYSTEMS AND VLSI

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit-I

Introduction: Embedded systems overview - design challenge - processor technology - IC technology - Design technology - Trade offs.**Single purpose Processors**: RT Level combinational logic - sequential logic (RT-LEVEL) - optimizing custom single purpose processors.**General purpose processors**: Basic architecture - operation – pipelining - programmer's view - development environment - application specific instrumentation – set processors (ASITPS) – Micro controllers and Digital signal processors.

Unit-II

MOS & BIMOS Technology: An introduction to MOS technology - BIMOS technology - Basic electrical properties of MOS & BIMOS circuits - MOS and BIMOS circuit design processors - Basic circuit concepts - sheet resistance - area capacitances of layers - the delay unit - scaling of MOS circuits - scaling models - scaling factors for device parameters.

Unit-III

Sub-system design and layout: Architectural issues - switch logic - Gate logic - examples of structured design (combinational logic) - Memory registers and aspects of system timing - system timing considerations - commonly used storage / memory elements.

Semiconductor integrated circuit design: PLA – FPGAS – CPLDS -standard cells - programmable array logic - design approach.

Unit-IV

Design Technology: Introduction to automation – synthesis - the parallel evolution of compilation and synthesis - logic synthesis - RT synthesis - behavioral synthesis - system synthesis and Hardware/Software code design – verification - Hardware/Software co simulation - reuse of intellectual property coder.

TEXT BOOKS:

1.Embedded system Design – A unified Hardware/ Software introduction by Frank Vahid, Tony D.Givargis

2. Introduction to Embedded systems by Raj kamal, TMH, 2002

3. Basic VLSI Design systems and circuits by Douglas A.Pucknell, Kamaran Eshraghian, PHI

4. Application of specific integrated circuits by Michael John Sebastian Smith, Addison Wesley

REFERENCE BOOKS:

1. Embedded Micro computer systems by Jonathan W. Valvano, Brooks/ cole, Thompson learning

2. Modern VLSI Design by Wayne Wolf, Pearson Education

EE424/(A) FACTS CONTROLLERS

Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit-I

FACTS Concept and General system Considerations:

Power Flow in AC system - definitions on FACTS - Basic types of FACTS Controllers. Converters for Static Compensation - Three Phase Converters and Standard Modulation Strategies (Programmed Harmonic Elimination and SPWM) - GTO Inverters - Multi-Pulse Converters and Interface Magnetics - Transformer Connections for 6 and 12 pulse operation.

Unit-II

Static Shunt Compensators:

SVC and STATCOM - Operation and Control of TSC, TCR, STATCOM - Comparison between SVC and STATCOM - STATCOM for transient and dynamic stability enhancement.

Unit-III

Static Series Compensation:

GCSC, TSSC, TCSC and SSSC - Operation and Control - External System Control for series Compensators - SSR and its damping - Static Voltage and Phase Angle Regulators - TCVR and TCPAR - Operation and Control.

Unit-IV

UPFC and IPFC:

The unified Power Flow Controller – Operation - Comparison with other FACTS devices - control of P and Q - Dynamic Performance - Special Purpose FACTS controllers - Interline Power flow Controller - Operation and Control.

TEXT BOOKS:

1. Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, 2000 by N.G. Hingorani & L.Gyugyi
2. Reactive Power Control in Electric Systems by T.J.E. Miller , John Wiley & sons

REFERENCE BOOKS:

1. Power Electronics by Ned Mohan et. al , John Wiley & sons
2. Journal & Conference papers from IEEE

EE424/(B) COMPUTER ORGANIZATION

Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

REGISTER TRANSFER AND MICROOPERATIONS: Register Transfer Language, Register Transfer, Bus and memory Transfers, Arithmetic Micro-operations, Logic Micro operations, Shift Micro operations, Arithmetic logic shift unit.

BASIC COMPUTER ORGANISATION AND DESIGN: Instruction codes, Computer Registers, Computer Instructions, Timing and control, Instruction cycle, Memory-Reference Instruction, Input-output and Interrupt, Design of basic computer, Design of accumulator logic.

UNIT – II

MICRO PROGRAMMED CONTROL: Control Memory, Address Sequencing, Micro program example, design of control unit.**CENTRAL PROCESSING UNIT :** General register organization, stack organization, Instruction formats, Addressing modes, Data transfer and manipulation, Program control, Reduced Instruction set computer (RISC).

PIPE LINE AND VECTOR PROCESSING: Parallel processing, pipelining, Arithmetic pipeline, RISC pipeline, vector processing, Array Processing.

UNIT – III

COMPUTER ARITHMETIC: Addition and Subtraction, multiplication Algorithms, Division Algorithms, Floating-point Arithmetic operations.**INPUT -OUTPUT OPERATIONS :** Peripheral Devices, Input-output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor, Serial communication.

UNIT - IV

MEMORY ORGANISATION: Memory hierarchy, Main memory, Auxiliary memory, Associate Memory, Virtual Memory, Memory management hardware.

MULTIPROCESSORS: Characteristics of multiprocessors, Interconnection Structures, Interprocessor Arbitation, Interprocessor communication and synchronization, cache coherence.

TEXT BOOKS:

1.Computer systems Architecture - by Morris M. ano (chapters: 4,5,7 to 13) (3rd edition).

REFERENCE BOOKS:

1. Computer Architecture and organisation - by John P Hayes (2nd Ed.)
2. Computer Organization - by V. Carl Hamacher et.al. (2nd ed.)

EE424(C) HVDC TRANSMISSION

Lectures	:	4 Periods/Week, Tutorial: 0	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Syllabus:

Unit-I

General considerations of AC and DC transmission:

1. economic advantages of DC over AC transmission
2. types of DC links ,brief description of the layout of a bipolar HVDC link - technical advantages of DC over AC transmission
3. Application of DC transmission system - planning and modern trends in DC transmission - brief summary of the technical details of HVDC projects in India.

Unit-II

Converter Circuits & Protection:

a. Properties of converter circuits.

b. Different kinds of arrangements. - Converter parameters and characteristics

c. Complete characteristics of 6 pulse and 12 pulse converters

4. Operation as an inverter
5. Converter parameters and characteristics
6. Values of transformer secondary currents - converter equations
7. Converter faults
8. Short circuit current
9. Arc back currents
10. Short circuit currents in rectifier and inverter
11. Protection against over currents
12. DC smoothing reactors
13. Bypass valves and DC circuit breakers.
14. Protection against over voltages
15. surge arresters

Unit-III

Converter and HVDC system Control :

Principles of DC link control.

Converter control characteristics.

Firing angle control.

Current and extinction angle control

Effect of source inductance

Starting and stopping of DC link

The four operating modes of the DC link in CG, AC, AG, CV.

Power control

Sources of reactive power

Reactive power requirements in steady state and reactive power

Introduction to HVDC simulator.

Unit-IV

Power Flow Analysis in AC/DC systems:

1. Modeling of DC links
2. Solution of DC load flow
3. Harmonics and Filters.
4. Generation of harmonics.
5. Characteristic and uncharacteristic harmonics.
6. Adverse effects of harmonics.
7. Calculation of voltage and current harmonics.
8. The impedance loci.
9. Methods of reducing the harmonics.
10. AC tuned and high pass filters, DC filters.
11. Telephonic interference.

TEXT BOOKS:

1. HVDC transmission by Adamson and Hingorani
2. HVDC transmission by J. Arrillaga, Peter Peregrinus
3. HVDC power transmissions systems: Technology and system interactions by K.R. Padiyar New age International (P) Ltd.

REFERENCE BOOKS:

1. Direct Current transmission by E.W.Kimbark, John Wiley
2. Power Transmission by Direct Current by E.Uhlmann, Springer-Verlag
3. HVDC power converters and systems by B.J.Cory and Mc Donald
4.EHVAC and HVDC transmission engineering and practice by S. Rao

PROJECT WORK

EE-461

Lectures	:	9 Periods/Week	Continuous Assessment	:	50
Final Exam	:	3 hours	Final Exam Marks	:	100

The Project work shall be carried out by a batch consisting not more than four students for one semester. It should help the students to comprehend and apply different theories and technologies that they have learnt through and are learning. 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 carryout the analysis, design, implementation and testing of the entire project basing on the Software Engineering principles. There shall be a total of four reviews made by the batch regarding:

0^{th} Review : 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.

1^{st} Review : The analysis and design carried out.

2^{nd} Review : The implementation and the testing done.

3^{rd} Review : Over all Presentation of the work carried out and the results found out for the valuation under the internal assessment.

A comprehensive report on the lines of IEEE Format 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 guide appointed by the University to make an assessment and to carryout the Viva-Voce examination.

Lectures	3 Periods/ Week	Continuous Assessment	40
Final Exam	3 Hours	Final Exam. Marks	60

EE462: POWER SYSTEMS LAB

LIST OF EXPERIMENTS:

1. Characteristics of over current relay & Earth fault relay
2. Characteristics of over voltage / under voltage relay
3. Characteristics of differential relay
4. Characteristics of definite time reverse power relay
5. Characteristics of negative sequence relay
6. Sequence impedances of alternator
7. Short circuit analysis using PC
8. Characteristics of distance relays
9. Power factor correction of induction motor
10. Determination of Transmission line parameters
11. Regulation and efficiency of transmission line including Ferranti effect
12. Develop a program for Y_{bus} by inspection
13. Develop a program for Z_{bus} using Z_{bus} building algorithm
14. Develop a program for Load flow analysis by Gauss - Seidel method
15. Develop a program for load flow analysis by Newton - Raphson method
16. Compensation of transmission line model using Facts devices
17. Develop program for load flow analysis by FDLP method.

Note: Minimum 10 experiments should be conducted.