BAPATLA ENGINEERING COLLEGE

(*Autonomous*)

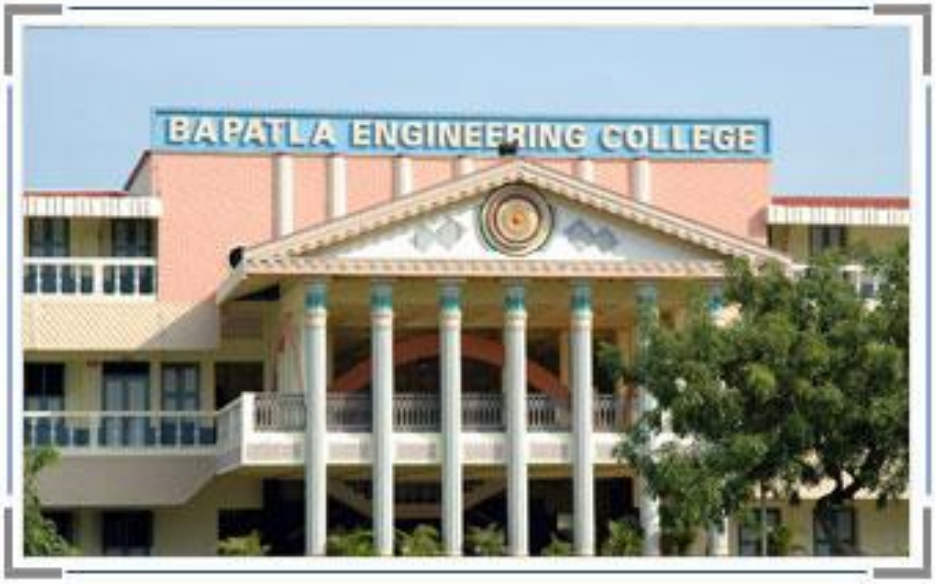
BAPATLA – 522102

ACADEMIC RULES & REGULATIONS and SYLLABUS
(w.e.f. 2014-2015)

B.Tech

ELECTRONICS AND COMMUNICATION ENGINEERING

(Semester System)



Bapatla Engineering College:: Bapatla

(Autonomous under Acharya Nagarjuna University)

(Sponsored by Bapatla Education Society)

BAPATLA - 522102 Guntur District, A.P.

www.becbapatla.ac.in

Academic Rules & Regulations for B. Tech Programme

(As Approved by The Academic Council & The Governing Body of the College)

(Amended in August 2014; Applicable to the students admitted into the First year B.Tech from the academic year 2014-2015 onwards).

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

2.0 ADMISSIONS:

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

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

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

1) When a student seeks transfer from other colleges to B.E.C and intends to pursue B.Tech at B.E.C in an eligible branch of study.
2) When students of B.E.C get transferred from one regulation to another regulation or from previous syllabus to revised syllabus.
3) When a student, after long discontinuity, rejoins the college to complete his/her Programme of study for the award of the degree.
4) When a student is not able to pursue his/her existing Programme of study but intends 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 from time to time. In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained and the Programme of study at B.E.C will be governed by the transitory regulations stipulated in ***5.3.***

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

SNo	Activity	Description
1.	Number of Semester in an Academic Year	Two
2.	Regular Semester duration in Weeks	19
3.	Academic Activities Schedule	
	Course Work	15 Weeks
	Examination Preparation	1 Week
	Examinations	2 Weeks
	Declaration of Results	1 Week
4.	Evaluation	Continuous Internal Evaluation (CIE) with a weightage of 40% and Semester End Examinations (SEE) with a weightage of 60% of the student's performance in course/laboratory work and other activities, if any.
5.	Other Items	The total number of working days in an academic year shall be >180;
		Academic schedules prescribed by the college shall be be adhered to by all the concerned.
		Students failing in any course (s) shall register for the same again (re-register) and shall secure SEE afresh in each course(s). This shall continue until a pass grade is obtained in the said course(s).

4.0 MINIMUM No. INSTRUCTION DAYS:

Each semester shall consist of a minimum of 90 instruction days.

5.0 Programmes of study in B.Tech:

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

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

5.2 Structure of the Programme:

5.2.1 Each Programme of a Discipline or a branch of study shall consist of:

1) General courses in Basic Sciences, Basic Engineering Sciences, Social Sciences & Humanities.
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 branch of study concerned.
4) Elective courses from either discipline or interdisciplinary areas to be chosen 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.

Humanities & Social Science, Basic Science and Engineering Science courses	30 -45%
Professional Core courses	35-45%
Professional Elective and Open Elective Courses	10-15%
Major Project / Seminar, etc	5-10%

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

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

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

Subject	**Credits**
Theory Course (4 Periods/Week)	03
Theory Course with additional Tutorial Period	04
Laboratory Course (3 Periods/Week)	02
Term paper (2 Periods/Week)	01
Business communication & Presentation Skills Lab (2 Periods/Week)	01
Final year Project (12 Periods/Week)	10

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

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

1) Equivalent courses completed by the student are established by the BOS concerned.
2) Marks/Credits are transferred for all such equivalent courses and treated as successfully cleared in the Programme of study prescribed by 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 accordingly.

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

5.4 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 Board of Studies concerned and is approved by the Academic council of the college.
2) In the case of students admitted through lateral entry, the respective regular curriculum contents from the second year onwards are to be pursued by such students.
3) In the case of students admitted under advanced standing, the Programme curriculum will be prepared by the Board of Studies concerned and the same shall be approved by the Academic Council.
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.

Table below shows a typical curriculum frame work for B.Tech Degree program.

S.No.	Subject Area	Average no. of credits
1.	Humanities & Social Sciences courses	14
2.	Basic Science Courses	35
3.	Engineering Science	32
4.	Professional Core courses	96
5.	Professional Elective Courses	16
6.	Major Project / Seminar, etc.	11
7.	Open Electives	3
	TOTAL	**207**

The students admitted through the **Lateral Entry scheme** have to complete **155** credits

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

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

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

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

6.0 EXAMINATION SYSTEM & EVALUATION:

6.1 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 Alternate Assessment Tests, term examinations on a continuous basis during the semester called Continuous Internal Evaluation (CIE) and a Semester End Examination (SEE) conducted at the end of the semester. For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester, except where stated otherwise in the detailed Scheme of Instruction.

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

Nature of the Course	**CIE**	**SEE**
Theory subjects	40	60
Drawing	40	60
Practical	40	60
Business communication & presentation Skills Lab	20	30
Term Paper	20	30
Project work	50	100

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

1. In each Semester there shall be two Term examinations and two tests from any of the ***Alternate Assessment Tools (AAT)*** like Home Assignment, Class Test, Problem Solving, Group Discussion, Quiz, Seminar and Field Study in every theory course. The Alternate Assessment Tool with detailed modality of evaluation for each course shall be finalized by the teacher concerned before beginning of the course with the permission of HOD concerned and the PRINCIPAL.

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, AAT and the calculation of marks for CIE in a theory course is given in the following table.

Weightage for different heads to calculate CIE for 40 marks in a Theory course			
Particulars	Term Exams (Max. 25 marks)	AAT (Max. 10 marks)	Attendance (Max.5 marks)
Better Performed exam	75% of marks obtained	50% of marks obtained	5
Other exam	25% of marks obtained	50% of marks obtained	

2. For drawing courses, there shall be only two Term examinations in a semester with no Alternate Assessment Tool. In case of such courses a maximum of 10 marks shall be given for day-to-day class work and a maximum of 25 marks shall be awarded to the Term examinations taking into account the performance of both the Term examinations giving weightage as prescribed above.

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

6.4 Semester End Examination (SEE) in Theory and Drawing subjects:

1) For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester for 100 marks and reduced to 60 marks for the combined performance in CIE & SEE purpose, 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.

2) A minimum of 40 marks are to be secured exclusively in the Semester End Examination (SEE) of theory/drawing course which shall be reduced to 24 marks (40%) and a minimum total of 40 marks in SEE and CIE 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.

6.5 Continuous Internal Evaluation (CIE) in laboratory courses:

1) The evaluation for Laboratory course is based on SEE and CIE. The CIE 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 internal lab teacher

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

6.6 Semester End Examination (SEE) in laboratory courses:

1) For each laboratory course, the Semester End Examination (SEE) shall be conducted by one internal and one external examiner appointed by the Principal and the duration of the exam shall be for three hours. The SEE is for 100 marks which include 15 marks for write up, 40 marks for lab experiment/exercise, 10 marks for record, 15 marks for result analysis and 20 marks for Viva-voce. The student performance in SEE shall be reduced to 60 marks.

2) A minimum of 50 marks shall be obtained in SEE which shall be reduced to 30 marks (50%) and a minimum total of 40 marks in SEE and CIE 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.

6.7. Evaluation of term paper and Business communication & Presentation Skills Lab:

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, and Business Communication & Presentation Skills Lab is to be taken up in the 7^{th} semester. The evaluation is based on CIE for 20 marks, which includes a minimum of two seminars/presentations for 10 marks and the report submitted at the end of the semester which is evaluated for 10 marks.

2) The Semester End Examination (SEE) shall be conducted for 100 marks by one internal and one external examiner appointed by the Principal. The same shall be reduced to 30 marks. The SEE contains Viva-voce and the demonstration of the model developed or work performed as a part of the term paper.

3) A minimum of 25 marks shall be obtained in SEE which is reduced to 15 (50 %) and a minimum total of 20 marks in SEE and CIE 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.

6.8 Evaluation of Project:

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

2) SEE 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 SEE exclusively and a minimum total of 60 marks in SEE and CIE put together are to be secured in order to be declared as passed in the Project and for the award of the grade.

6.9 A student who could not secure a minimum of 50% aggregate marks in CIE of a semester is not eligible to appear for the Semester End 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 Internal Evaluation (CIE), for any reason whatsoever, shall be deemed to have scored zero marks in the respective component and no provision for make-up shall be provided.

6.10 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 Internal Evaluation (CIE/Internal marks) subject to the following:

If the student becomes eligible to appear for the Semester End Examination (SEE) of a semester and is unable to secure 40% internal marks in a particular theory subject due to genuine reasons, he/she may be given an opportunity to appear for makeup test in any one subject of 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 HOD concerned and approved by the principal.

6.11 Course Repetition: The students secured less than 40% in the Continuous Internal Evaluation (CIE) and Semester End Examinations (SEE) may register for the course repetition. The students have to apply to the Principal through the respective HOD by paying prescribed fees. A student can take up a maximum of two courses in a semester immediately after the semester end examinations of that particular semester.

The HODs concerned have to allot a teacher related to that course to conduct class work. The minimum number of periods to be conducted should not be less than 50% of the total prescribed periods for that course. The classes will be conducted in the vacation period or in the weekends or in the afternoons as decided by the HOD concerned. Teacher has to evaluate the student for his performance in CIE as per the autonomous norms and students should appear for a semester end examination. The pass criteria in both CIE & SEE should be as per autonomous norms.

7.0 ATTENDANCE REGULATIONS:

7.1 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.

7.1.1 A maximum of 5 marks weightage in CIE in each theory/drawing course shall be given for those students who put in a minimum of 65% attendance in the respective theory/drawing course in a graded manner as indicated below:

Attendance of 65% and above but less than 75%	4 mark
Attendance of 75% and above but less than 80%	6 mark
Attendance of 80% and above but less than 90%	8 marks
Attendance of 90% and above	10 marks

The above marks are scaled and reduced to maximum of 5 marks for the purpose of calculating attendance weightage.

7.2 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.

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

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

8.1 The student does not have a minimum average 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 CIE 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 Semester End Examination (SEE), conducted at the end of the semester.

9.0 CONDITIONS FOR PROMOTION:

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

9.2 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.

9.3 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 courses).

9.4 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 courses).

10.0 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.

10.1 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.

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

11.0 GRADING SYSTEM

11.1 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%

11.2 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**.

12.0 GRADE POINT AVERAGE

12.1 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.

12.2 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.

12.3 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.

12.4 Example

Semester	Course Code.	Credits	Grade	Grade Point	Credit Points	SGPA	CGPA
I	14MA101	4	C	5	20	**7.73 (201/26)**	**7.73 (201/26)**
I	14PH102	3	B	6	18		
I	14CH103	3	A	8	24		
I	14EL104	3	O	10	30		
I	14ES105	3	A+	9	27		
I	14EG106	4	B+	7	28		
I	14CHL101	2	O	10	20		
I	14ELL102	2	A	8	16		
I	14WSL103	2	A+	9	18		
Total		**26**			**201**		
II	14MA201	4	A	8	32	**7.96 (207/26)**	**7.84 (408/52)**
II	14PH202	3	B	6	18		
II	14CH203	3	A+	9	27		
II	14EE204	3	C	5	15		
II	14EM205	4	O	10	40		
II	14CP206	3	B+	7	21		
II	14PHL201	2	A+	9	18		
II	14HWL202	2	A	8	16		
II	14CPL203	2	O	10	20		
Total		**26**			**207**		

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

1) Registered and successfully completed all the components prescribed in the Programme of study to which he/she is admitted,
2) Obtained CGPA greater than or equal to 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.

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

Table: CGPA required for award of Degree

Distinction	**≥ 8.0***
First Class	**≥ 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**.

14.1 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.

14.2 **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.

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

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

15.0 IMPROVEMENT OF CLASS:

15.1 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 CIE in any course or for Semester End Examination (SEE) in laboratory courses (including Project Viva-voce) for the purpose of improvement.

16.0 SUPPLEMENTARY EXAMINATIONS: In addition to the Regular Final Examinations held at the end of each semester, Supplementary Final Examinations will be conducted during the academic year. Candidates taking the Regular / Supplementary examinations as Supplementary candidates may have to take more than one Final Examination per day. 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 shall not be relaxed under any circumstances.

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

18.0 MALPRACTICES:

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

19.0 ADDITIONAL ACADEMIC REGULATIONS:

19.1 Any attempt to impress upon the teachers, examiners, faculty and staff of Examinations, bribing for either marks or attendance will be treated as malpractice.

19.2 When a student is absent for final examination, he/she is treated as to have appeared and obtained zero marks in that component and Grade is awarded accordingly.

19.3 When a component of Continuous Internal Evaluation (CIE) or Semester End Examination (SEE) is cancelled as a penalty, he/she is awarded zero marks in that component.

20.0 AMENDMENTS TO REGULATIONS:

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

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Communication Engineering

For 2014-15 Batch

First Year B.Tech., (SEMESTER – I)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14MA101	Engineering Mathematics – I	4	1	0	0	5	40	60	100	4
14PH102	Engineering Physics – I	4	0	0	0	4	40	60	100	3
14CY103	Engineering Chemistry – I	4	0	0	0	4	40	60	100	3
14EE104	Basic Electrical and Electronics Engineering	4	0	0	0	4	40	60	100	3
14EM105	Engineering Mechanics	4	1	0	0	5	40	60	100	4
14CP106	Problem Solving with Programming	4	0	0	1	5	40	60	100	3
14PHL101	Physics lab	0	0	3	0	3	40	60	100	2
14HWL102	Hardware Lab	0	0	3	0	3	40	60	100	2
14CPL103	Problem Solving with Programming Lab	0	0	3	0	3	40	60	100	2
	TOTAL	24	2	9	1	36	**360**	**540**	**900**	**26**

L: Lecture T: Tutorial P: Practical S: Self Study
CIE: Continuous Internal Evaluation SEE: Semester End Examination

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Communication Engineering

For 2014-15 Batch

First Year B.Tech., (SEMESTER – II)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14MA201	Engineering Mathematics – II	4	1	0	0	5	40	60	100	4
14PH202	Engineering Physics – II	4	0	0	0	4	40	60	100	3
14CY203	Engineering Chemistry – II	4	0	0	0	4	40	60	100	3
14EL204	Communicative English	4	0	0	0	4	40	60	100	3
14ES205	Environmental Studies	4	0	0	0	4	40	60	100	3
14EG206	Engineering Graphics	4	1	0	1	6	40	60	100	4
14CYL201	Chemistry Lab	0	0	3	0	3	40	60	100	2
14ELL202	English Communication and Skills Lab	0	0	3	0	3	40	60	100	2
14WSL203	Workshop	0	0	3	0	3	40	60	100	2
	TOTAL	24	2	9	1	36	**360**	**540**	**900**	**26**

L: Lecture T: Tutorial P: Practical S: Self Study

CIE: Continuous Internal Evaluation SEE: Semester End Examination

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Communication Engineering

For 2014-15 Batch

Second Year B.Tech., (SEMESTER – III)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14EC301/ 14MA301	Engineering Mathematics–III	3	1			4	40	60	100	3
14EC302	Data Structures using C	3	1			4	40	60	100	3
14EC303	Electronic Devices	3	1			4	40	60	100	3
14EC304	Signals and Systems	3	2			5	40	60	100	4
14EC305	Digital Electronics	3	2			5	40	60	100	4
14EC306	Circuit Theory	3	1		1	5	40	60	100	3
14ECL301	Data Structures Lab			3		3	40	60	100	2
14ECL302	Electronic Devices Lab			3		3	40	60	100	2
14ECL303	Digital Electronics Lab			3		3	40	60	100	2
	TOTAL	18	8	9	1	36	360	540	900	26

L: Lecture T: Tutorial P: Practical S: Self Study

CIE: Continuous Internal Evaluation SEE: Semester End Examination

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Communication Engineering

For 2014-15 Batch

Second Year B.Tech., (SEMESTER – IV)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14EC401/14 MA401	Engineering Mathematics– IV	3	1			4	40	60	100	3
14EC402	Electronic Circuits – I	3	1		1	5	40	60	100	3
14EC403	Electromagnetic Field Theory	3	1			4	40	60	100	3
14EC404	Analog Communications	3	2			5	40	60	100	4
14EC405	Network analysis and Synthesis	3	2			5	40	60	100	4
14EC406	Basic Instrumentation	3	2			4	40	60	100	3
14ECL401	Electronic Circuits – I Lab			3		3	40	60	100	2
14ECL402	Analog Communication Lab			3		3	40	60	100	2
14ECL403	Signals and Systems lab			3		3	40	60	100	2
	TOTAL	18	8	9	1	36	360	540	900	26

L: Lecture T: Tutorial P: Practical S: Self Study

CIE: Continuous Internal Evaluation SEE: Semester End Examination

BAPATLA ENGINEERING COLLEGE :: BAPATLA

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Communication Engineering

For 2014-15 Batch

Third Year B.Tech., (SEMESTER – V)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14EC501	Linear Integrated Circuits	3	2			5	40	60	100	4
14EC502	Linear Control Systems	3	2			5	40	60	100	4
14EC503	Electronic Circuits – II	3	1			4	40	60	100	3
14EC504	EM Waves and transmission lines	3	1			4	40	60	100	3
14EC505	Digital Communications	3	1			4	40	60	100	3
14EC506	Elective-1	3	1		1	5	40	60	100	3
14ECL501	PSPICE Lab			3		3	40	60	100	2
14ECL502	Integrated Circuits Lab			3		3	40	60	100	2
14ECL503	Digital Communications Lab			3		3	40	60	100	2
	TOTAL	18	8	9	1	36	360	540	900	26

L: Lecture T: Tutorial P: Practical S: Self Study
CIE: Continuous Internal Evaluation SEE: Semester End Examination

Elective- I

14EC506A Pulse and Switching Circuits
14EC506B Probability and Stochastic Process
14EC506C Linear Algebra
14EC506D Discrete Mathematics

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For
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Third Year B.Tech., (SEMESTER – VI)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14EC601	Professional Ethics and Human values	3	1			4	40	60	100	3
14EC602	Microprocessors and Microcontrollers	3	2			5	40	60	100	4
14EC603	Digital Signal Processing	3	2			5	40	60	100	4
14EC604	Antenna and Wave Propagation	3	1			4	40	60	100	3
14EC605	Object Oriented Programming with Java	3	1		1	5	40	60	100	3
14EC606	Elective – II	3	1			4	40	60	100	3
14ELL601	Soft Skills Lab			3		3	40	60	100	2
14ECL602	Microprocessors & Microcontrollers Lab			3		3	40	60	100	2
14ECL603	Object Oriented Programming using Java Lab			3		3	40	60	100	2
	TOTAL	18	8	9	1	36	360	540	900	26

L: Lecture T: Tutorial P: Practical S: Self Study
CIE: Continuous Internal Evaluation SEE: Semester End Examination

Elective- II

14EC606A Computer Organization and Architecture
14EC606B Communication Systems
14EC606C Bio-Medical Electronics
14EC606D Robotics

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Communication Engineering

For 2014-15 Batch

Final Year B.Tech., (SEMESTER – VII)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14EC701	Industrial Management and Entrepreneurship Development	3	1			4	40	60	100	3
14EC702	VLSI Design	3	2			5	40	60	100	4
14EC703	Microwave Theory and Techniques	3	1			4	40	60	100	3
14EC704	Digital Image Processing	3	1			4	40	60	100	3
14EC705	Elective - III	3	2			5	40	60	100	4
14OE706	Open Elective	3	1			4	40	60	100	3
14ELL701	Interview Skills Lab			2		2	20	30	50	1
14ECL702	Verilog HDL Lab			3		3	40	60	100	2
14ECL703	Signal and Image Processing Lab using Scilab			3		3	40	60	100	2
14ECL704	Term paper			2		2	20	30	50	1
	TOTAL	18	8	10	0	36	360	540	900	26

L: Lecture T: Tutorial P: Practical S: Self Study

CIE: Continuous Internal Evaluation SEE: Semester End Examination

Elective- III

14EC705A Computer Networks

14EC705B Fuzzy Logic

14EC705C Global Positioning System and Applicatioins

14EC705D Satellite Communications

Open Elective

LIST OF OPEN ELECTIVES

DEPARTMENT	SUBJECT NAME	SUBJECT CODE
Chemical Engineering.	Industrial Pollution & Control	ChE 01
	Energy Engineering	ChE 02
Civil Engineering.	Air Pollution & Control	CE 01
	Remote Sensing & GIS	CE 02
Computer Science & Engineering.	Database Management Systems	CS 01
	Java Programming	CS 02
Electrical & Electronics Engineering.	Optimization Techniques	EE 01
	Non-Conventional Energy Sources	EE 02
Electronics & Communication Engineering.	Consumer Electronics	EC 01
	Embedded Systems	EC 02
Electronics & Instrumentation Engineering.	Virtual Instrumentation Using LABVIEW	EI 01
	Sensors & Transducers	EI 02
Information Technology.	Mobile Application Development	IT 01
	Web Technologies	IT 02
Mechanical Engineering.	Automobile Engineering	ME 01
	Refrigeration & Air Conditioning	ME 02
BOSCH REXROTH Centre	Automation Technology	BR 01

BAPATLA ENGINEERING COLLEGE :: BAPATLA

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Communication Engineering

For 2014-15 Batch

Final Year B.Tech., (SEMESTER – VIII)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14EC801	Radar Engineering	2	2			4	40	60	100	3
14EC802	Fiber Optic Communications	2	2			4	40	60	100	3
14EC803	Elective –IV	3	2			5	40	60	100	4
14EC804	Elective – V	2	2		1	5	40	60	100	3
14ECL801	Microwave & Optical Communication Lab			3		3	40	60	100	2
14ECPR802	Project Work			12		12	50	100	150	10
	TOTAL	9	8	15	1	33	250	400	650	25

L: Lecture T: Tutorial P: Practical S: Self Study
CIE: Continuous Internal Evaluation SEE: Semester End Examination

Elective- IV

14EC803A Artificial Intelligence and Machine Learning
14EC803B Speech and Audio Processing
14EC803C Information Theory and Coding
14EC804D Mobile Communications

Elective- V

14EC804A Neural Networks
14EC804B Advanced Microcontrollers
14EC804C Software Defined Radio
14EC804D Adaptive Signal Processing

Engineering Mathematics – I

(Common for all branches)

SUB CODE: 14MA101

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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

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

UNIT IV

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.

TEXT BOOK:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th 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 – I

(Common for all branches)

SUB CODE: 14PH102

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

OPTICS:

INTERFERENCE: Coherence, spatial and temporal coherences, interference due to thin films(reflected system), cosine law, anti-reflection coating, Michelson interferometer and its applications, (determination of wavelengths of monochromatic light and resolution of two nearby wavelengths)., Newton's rings theory and applications(determination of wavelength of light, and refractive index of transparent liquid).

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

POLARISATION: Introduction, double refraction,Nicol prism, quarter wave plate, half wave plate, production and detection of circularly and elliptically polarised lights and optical activity, Electro optic effect(Kerr effect),Magneto optic effect(Faraday effect).

UNIT II

LASERS & FIBER OPTICS:

LASERS: Properties of lasers**,** Spontaneous and stimulated emissions, Population inversion, 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, losses in optical fibers, fiber optic communication and its advantages.

UNIT III

ELECTRICITY & MAGNETISM:

Gauss's law in static electricity (qualitative only), Gauss's law of magnetism, circulating charges, Cyclotron-construction, 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, AC circuit containing series LCR circuit-resonance condition and quality factor.

UNIT IV

MODERN PHYSICS:

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

TEXT BOOK:

1. A Text Book of Engineering Physics, M.N. Avadhanulu, P.G. Kshirasagar, S.Chand& Co., (Edition – 2013).

REFERENCE BOOKS:

1. "Engineering physics" by R.K.Gour and S.L.Gupta. Dhanpat rai publications.
2. "Basic Engineering Physics" by P.Srinivasa rao & K.Muralidhar,Himalaya publications.
3. "Engineering physics" by M.R.Sreenivasan. New age international publications.
4. "Engineering physics" by Palani swamy. Scitech publications.

Engineering Chemistry – I

(Common for all branches)

SUB CODE: 14CY103

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Water Technology:

Characteristics: **Alkalinity** – types of alkalinity and determination (problems); **Hardness** – types and estimation by EDTA method (problems); **Domestic water treatment** – disinfection methods (Chlorination, ozonation, UV treatment); **Boiler feed water** --disadvantages of using hard water in boilers: Scales, Sludges, Caustic embrittlement, boiler corrosion, Priming and foaming; **Internal conditioning** - phosphate, calgon and carbonate methods; **External conditioning** - Ion exchange process, Lime Soda process; **Desalination** of brackish water by electro dialysis and reverse osmosis.

UNIT II

Polymers: Classification, polymerization: types – addition and condensation polymerization; Mechanism of free radical polymerization with suitable example; Polymer Tacticity and Ziegler Natta polymerization (mechanism).

Plastics: Classification; Preparation, properties and uses of PVC, Teflon, Bakelite, Nylon-6, 6.
Rubbers: Natural rubber**,** Vulcanization of rubber; Synthetic rubbers: Buna-S, Buna-N and Poly urethane.

Surface Chemistry: Solid surfaces, types of adsorption, Frendlich and Longmuir adsorption isotherm, Applications of adsorption: Role of adsorbents in catalysis.

UNIT – III

Renewable and Non Renewable Energy Sources:

Thermal and Chemical energy: Introduction to solid fuels; Calorific value (lower, higher) – determination of calorific value (Bomb Calorimeter), Coal ranking, Carbonization of coal (Bee Hive method and Otto-Hoffman by-product method); Proximate and ultimate analysis of coal.

Solar cells-Introduction, Solar Panels, Applications; **Fuel Cells**: Hydrogen – Oxygen Fuel Cell; **Batteries** – Alkaline Battery, Lead – acid, Nicad and Lithium Batteries

UNIT – IV

Engineering Materials:

Refractories: Classification – Acidic, Basic and Neutral refractories; Properties: refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling; Properties and applications 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.

TEXT BOOK:

1. P.C. Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2010), 15th edition.

REFERENCE BOOKS:

1. S.S Dara & Mukkanti K. "A text book of engineering chemistry" S. Chand & Co. Ltd., New Delhi (2006).
2. "Text Books of Engineering Chemistry" by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).
3. B.K. Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
4. B. Sivasankar "Engineering Chemistry" Tata McGraw Hills co., New Delhi (2008).
5. Engineering Chemistry J.C Kuriacase & J.Rajaram, Tata McGraw Hills co., New Delhi 1. (2004).
6. "Chemistry of Engineering Materials" by R.P. Mani and K.N. Mishra, CENGAGE learning.
7. "Applied Chemistry – A test for Engineering & Technology" – Springar (2005).
8. "Text Book of Engineering Chemistry" - Shasi Chawla, Dhanpat Rai publishing company, New Delhi (2008).
9. "Engineering Chemistry" – R. Gopalan, D. Venkatappayya, D.V. Sulochana Nagarajan – Vikas Publishers (2008).

Basic Electrical and Electronics Engineering

(Common for all branches)

SUB CODE: 14EE104 / 14EE204

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Basic Concepts of Electric Circuits: Introduction, Electric Current, Ohm's Law, Work, Power, and Energy, Dynamically Induced EMF and Statically Induced EMF, Self-induced EMF and Mutually Induced EMF, Self-inductance of a Coil, Mutual Inductance, Energy Stored in a Magnetic Field, Electrical Circuit Elements, Energy Stored in a Capacitor, Capacitor in Parallel and in Series.

DC Networks and Network Theorems: DC Network Terminologies, Voltage and Current Sources, Series Parallel Circuits, Voltage and Current Divider Rules, Kirchhoff's Laws, Maxwell's Mesh Current Method, Nodal Voltage Method (Nodal Analysis), Network Theorems (Superposition Theorem, Thevenin's Theorem, Norton's Theorem).

UNIT – II

AC Fundamentals: Introduction, Generation of Alternating Voltage in an Elementary Generator, Concept of Frequency, Cycle, Time Period, Instantaneous Value, Average Value, and Maximum Value, Sinusoidal and Non-sinusoidal Wave Forms, Concept of Average Value and Root Mean Square (RMS) Value of an Alternating Quantity, Analytical Method of Calculation of RMS Value, Average Value, and Form Factor, RMS and Average Values of Half-wave rectified Alternating Quantity, Concept of Phase and Phase Difference.

Transformers: Introduction, Basic Principle and Constructional Details, EMF Equation.

UNIT – III

Semiconductor Devices: Introduction, Review of Atomic Theory, Binding Forces Between Atoms in Semiconductor Materials, Extrinsic Semiconductors, Semiconductor Diodes; Volt-ampere Characteristic of a Diode, An Ideal Diode, Diode Parameters and Diode Ratings, Zener Diode; Zener Diode As Voltage Regulator, Zener Diode As a Reference Voltage, Bipolar Junction Transistors; Working of a n-p-n Transistor, Working of a p-n-p Transistor, Transistor Configurations, Transistor As an Amplifier, Transistor As a Switch, Rectifiers and Other Diode Circuits.

Rectifiers: Introduction, Half-Wave, Full wave Rectifiers and their analysis, Comparison of Half-Wave and Full-Wave Rectifiers.

UNIT – IV

Digital Electronics: Introduction, Number System, Octal Number System, Hexadecimal Number System, Application of Binary Numbers in Computers, Logic Gates, Boolean Algebra, De Morgan's Theorem, Combinational Circuits, Simplification of Boolean Expressions Using De Morgan's Theorem.

Integrated Circuits: Introduction, Fabrication of Monolithic ICs, Hybrid Integrated Circuits, Linear and Digital ICs.

TEXT BOOK:

1. "Basic Electrical and Electronics Engineering", S.K. Bhattacharya, Pearson Publications

REFERENCE BOOKS:

1. "Basic Electrical, Electronics and Computer Engineering", Muthusubramanian R, Salivahanan S and Muraleedharan K A, Tata McGraw Hill, Second Edition, (2006).
2. "Basics of Electrical and Electronics Engineering", Nagsarkar T K and Sukhija M S, Oxford press University Press.

Engineering Mechanics

(Common for all branches)

SUB CODE: 14EM105 / 14EM205

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

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

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

General Case of Forces in a Plane: Composition of forces in a plane – Equilibrium of forces in a plane – Plane trusses: methods of joints.

UNIT – II

Forces in space: Concurrent forces in space: method of projections – parallel forces in space.

Friction: Characteristics of friction – problems involving dry friction.

Principle of Virtual Work: Equilibrium of Ideal systems.

UNIT – III

Rectilinear Translation: Kinematics of rectilinear motion – principles of dynamics – Differential equations of rectilinear motion D'Alemberts principle – momentum and impulse – work and energy – ideal systems: conservation of energy.

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

UNIT – IV

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

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

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

TEXT BOOKS:

1. "Engineering mechanics" by S. Timoshenko and D. H. Young – Mc Graw-Hill International edition (For concepts and symbolic problems).
2. "Engineering mechanics statics and dynamics" by A. K. Tayal – Umesh publication, Delhi (For numerical problems using S.I. system of units).

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 statics and dynamics" by R. C. Hibbeler and Ashok Gupta - Pearson (For numerical problems using S.I. system of units).

Problem Solving with Programming

(Common for all branches)

SUB CODE: 14CP106 / 14CP206

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Basics and Introduction to C, The C Declarations, Operators and Expressions, Input and Output in C, Decision Statements, 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

Loop Control, Data Structure: Array, 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

Strings and Standard Functions, Pointers, Dynamic Memory Allocation and Linked List: Dynamic Memory Allocation, Memory Models, Memory Allocation Functions.

Functions, Storage Class, 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.

UNIT – IV

Preprocessor Directives: Introduction, The #define Directive, Undefining a Macro, Token Pasting and Stringizing Operators, The #include Directive, Conditional Compilation, The #ifndef Directive.

Structure and Union, Files, 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, sorting a list of names using command line arguments.

TEXT BOOK:

1. Ashok N. Kamthane, “Programming in C”, PEARSON 2nd Edition.

REFERENCE BOOKS:

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

Physics Laboratory

(Common for all branches)

SUB CODE: 14PHL101 / 14PHL201

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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. Determine the rigidity modulus of the given material of the wire using Torsional pendulum.
11. Draw the load characteristic curves of a solar cell.
12. Determination of Hall coefficient of a semiconductor.
13. Determination of voltage and frequency of an A.C. signal using C.R.O.
14. Determination of Forbidden energy gap of Si &Ge.
15. Determination of wavelength of laser source using Diode laser.

TEXT BOOK:

1. "Engineering physics laboratory manual" P. Srinivasa rao & K. Muralidhar, Himalaya publications.

Hardware Laboratory

(Common for all branches)

SUB CODE: 14HWL102 / 14HWL202

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF EXPERIMENTS

1. Identification and testing of various electronic components. (Resistors, Inductor, Capacitor, Transistor, ICs and Bread board).
2. Study of Oscilloscope, Function generator, Power supply and Multi meter.
3. KCL & KVL verification for simple circuits on Bread board.
4. Study of Ceiling fan.
5. Study of Florescent lamp.
6. Study of Single Phase Transformer.
7. Identifying all parts of computers.
8. Install and Uninstall system and application software.
9. Assembling a Computer.
10. Connecting computers in a network.

Problem Solving with Programming Laboratory

(Common for all branches)

SUB CODE: 14CPL103 / 14CPL203

Lectures: 0 Tutorial: 0 Practical: 3 Self Study: 0

Continuous Internal Assessment: 40 Semester End Examination (3 Hours): 60

LIST OF EXPERIMENTS

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

Domestic Customer:		
Consumption Units	**Rate of Charges(Rs.)**	
0 – 200	0.50 per unit	
201 – 400	100 plus	0.65 per unit
401 – 600	230 plus	0.80 per unit
601 and above	390 plus	1.00 per unit
Commercial Customer:		
Consumption Units	**Rate of Charges(Rs.)**	
0 – 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):
   a) $1 + x^2/2! + x^4 / 4!+$ …upto ten terms
   b) $x + x^3/3! + x^5/5!+$ … upto 7 digit accuracy
3. Write a C program to check whether the given number is
   a) Prime or not.
   b) Perfect or Abundant or Deficient.
4. Write a C program to display statistical parameters (using one – dimensional array).
   a) Mean
   b) Mode
   c) Median
   d) Variance.
5. Write a C program to read a list of numbers and perform the following operations
   a) Print the list.
   b) Delete duplicates from the list.
   c) Reverse the list.
6. Write a C program to read a list of numbers and search for a given number using Binary search algorithm and if found display its index otherwise display the message "Element not found in the List".
7. Write a C program to read two matrices and compute their sum and product.
8. A menu driven program with options (using array of character pointers).
   a) To insert a student name
   b) To delete a student name

c) To print the names of students

9. Write a C program to read list of student names and perform the following operations
    a) To print the list of names.
    b) To sort them in ascending order.
    c) To print the list after sorting.
10. Write a C program that consists of recursive functions to
    a) Find factorial of a given number
    b) Solve towers of Hanoi with three towers (A, B & C) and three disks initially on tower A.
11. A Bookshop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book the sales person inputs the title and the author, and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed, if it is, then the system displays the book details and request for the number of copies required ,if the requested copies are available the total cost of the requested copies is displayed otherwise the message "required copies not in stock" is displayed. Write a program for the above in structures with suitable functions.

12. Write a C program to read a data file of students' records with fields (Reg. no, Name, M1, M2, M3, M4, M5) and write the successful students data (percentage > 40%) to a data file.

Engineering Mathematics – II

(Common for all branches)

SUB CODE: 14MA201

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

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 – II

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.

UNIT – III

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 – 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, 9th edition, John Wiley & Sons.

REFERENCE BOOK:

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

Engineering Physics – II

(Common for all branches)

SUB CODE: 14PH202

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Electron theory of solids & semiconductor physics:

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, concepts of energy band gap and hole.

Semiconductor physics: Classification of semiconductors, density of states, carrier concentration in intrinsic and extrinsic semiconductors, law of mass action, conductivity in semiconductors (drift and diffusion), Equation of continuity, P-N junction diode and its V-I characteristics.

UNIT – II

Magnetic, Dielectric and Ferro-electric materials: Origin of magnetic moment of an atom, Bohr magneton, Domain theory of Ferro magnetism, curie-weiss law(Qualitative), Hysteresis curve, soft and hard magnetic materials, ferrites and its applications.

Dielectric materials: Types of polarizations, internal field (qualitative), Classius – Mossotti equation, Frequency dependence of polarization, Ferroelectrics and its applications, strength of dielectrics and dielectric breakdown.

UNIT – III

Advanced materials:

Nano-materials: Introduction to nano-materials, surface to volume ratio, quantum confinement, properties of nano materials, Fabrication of nano-materials(CVD and sol-gel methods) , carbon nano tubes and its properties, Applications of nano materials.

Superconductivity: Critical temperature, critical magnetic field and critical current. Meissner effect, type-I and type-II superconductors, attractive interactions, qualitative treatment of BCS theory and, Josephson's junction, Applications of superconductors.

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

UNIT – IV

Analytical techniques:

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 and Ultrasonic imaging.

Industral applications: NDT (Pulse echo technique) and cavitation effect. Time of flight diffraction technique.

Structure determination: Crystal lattices (Bravais), and planes, Miller indices, Bragg's law, structural analysis of crystals using X-Ray powder diffraction method.

TEXT BOOK:

1. "A Text Book of Engineering Physics", M.N.Avadhanulu& P. Krushisagar, S.Chand Publication., (Edition – 2013).

REFERENCE BOOKS:

1. "Engineering physics" by R.K.Gour and S.L.Gupta. Dhanpat rai publications.
2. "Basic Engineering Physics" by P.Srinivasa rao & K.Muralidhar,Himalaya publications.
3. "Engineering physics" by M.R.Sreenivasan. New age international publications.
4. "Engineering physics" by Palani swamy. Scitech publications.

Engineering Chemistry – II

(Common for all branches)

SUB CODE: 14CY203

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Electro Chemistry:

Electrode potential, Determination of single electrode potential; Nernst equation (problems); Electrochemical series – significance; Electro chemical cells, Reversible and irreversible cells, EMF – measurement of emf, Reference electrodes – Standard Hydrogen electrode, Calomel electrode, Ion selective electrode – glass electrode – measurement of pH; Potentiometric titrations (redox – Fe^{2+} *vs* dichromate, and precipitation – Ag^{+} *vs* Cl^{-} titrations) and Conductometric titrations (acid-base).

UNIT – II

Corrosion and Corrosion Control:

Types of corrosion - Chemical or dry corrosion, Pilling – Bedworth rule; Electrochemical or wet corrosion; Galvanic corrosion, pitting, stress and differential aeration corrosion; factors influencing corrosion; Corrosion control – sacrificial anode method and impressed current cathodic methods, corrosion inhibitors; Protective coatings: Paints – constituents and functions, Metallic coatings – electro plating (Au) and electroless plating (Ni).

Green Chemistry: Introduction, principles of green chemistry; engineering applications.

UNIT – III

Liquid and Gaseous Fuels:

Petroleum based: Petroleum processing and fractions; Cracking – catalytic cracking 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.

Phase rule:

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).

UNIT – IV

Analytical Techniques:

Beer-Lambert's law; Principle, instrumentation (with block diagram) and applications of UV-visible spectroscopy and IR spectroscopy; Estimation of iron by Colorimetry; Flame photometry: principle, instrumentation (with block diagram) and estimation of sodium; Atomic absorption spectroscopy: principle, instrumentation (with block diagram) and estimation of nickel.

TEXT BOOK:

1. P.C. Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2010), 15th edition.

REFERENCE BOOKS:

1. S.S Dara & Mukkanti K. "A text book of engineering chemistry" S. Chand & Co. Ltd., New Delhi (2006).
2. B. Sivasankar "Engineering Chemistry" Tata McGraw Hills co., New Delhi (2008).
3. B.K. Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
4. "Engineering Chemistry" J. C Kuriacase & J. Rajaram, Tata McGraw Hills co., New Delhi 1. (2004).
5. "Chemistry of Engineering Materials" by R.P. Mani and K.N. Mishra, CENGAGE learning.
6. "Applied Chemistry – A test for Engineering & Technology" – Springar (2005).
7. "Text Book of Engineering Chemistry" - Shasi Chawla, Dhanpat Rai publishing company, New Delhi (2008).
8. "Engineering Chemistry" – R. Gopalan, D. Venkatappayya, D.V. Sulochana Nagarajan – Vikas Publishers (2008).

Communicative English

(Common for all branches)

SUB CODE: 14EL204 / 14EL104

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

a) Text: (i) *Study Skills for a Successful Semester (*page 5)
(ii) *Concerning the Unknown Engineer* (page 27)

b) Grammar: Parts of Speech, Subject-Verb agreement

c) Vocabulary Development: Vocabulary in the lessons *Study Skills for a Successful Semester and Concerning the Unknown Engineer*

d) Writing Skills: Writing a Good Paragraph with Notes, Writing a cohesive text, clutter free writing.

UNIT – II

a) Text: (i) A Shadow by R.K.Narayanan (page no116)
(ii) Clutter (page no 69)

b) Grammar: Tenses.

c) Vocabulary Development: Vocabulary in the lessons *A Shadow and Clutter.*

d) Writing Skills: Essay Writing.

UNIT – III

a) Text: (i)*Bionics* (pg.no:157)
(ii) *Primping the pump* by Zig Ziglar (Pg.No: 138)

b) Grammar: Auxiliary Verbs, Conditionals, Articles and Determiners.

c) Vocabulary Development: Vocabulary in the lessons *Bionics and primping the pump* by Zig Ziglar.

d) Writing Skills: Letter writing, E-Mail writing

UNIT – IV

a) Text: (i) *Human Cloning* (Pg.no 194)
(ii) *The Stranger within* (Pg.No: 237)

b) Grammar: Voice, Reported Speech, Gerund

c) Vocabulary Development: Vocabulary in the Lessons *Human Cloning* and *the Stranger Within.*

d) Writing Skills: Abstract, Proposal and executive summary writing on Technical basis.

TEXT BOOK:

1. "*Innovate with English*" by T. Samson, First Edition, Cambridge University Press: New Delhi.

REFERENCE BOOKS:

1. "Practical English Usage" by Michael Swan, 3rd Edition, OUP.
2. "Intermediate English Grammar" by Raymond Murphy, CUP.
3. "Study: Reading" by Eric H. Glendinning, 2nd Edition CUP.
4. "Business Correspondence and Report writing" by R.C Sharma, Tata McGrawhill.

Environmental Studies

(Common for all branches)

SUB CODE: 14ES205 / 14ES105

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

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

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

UNIT – II

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

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

UNIT – III

Pollution: Definition; Causes, effects and control of air, water and nuclear pollution; Solid Waste: urban, Industrial and hazardous wastes; Integrated waste management - 3R approach, composting and vermicomposting.

Environmental issues: Green house effect & Global warming, Ozone layer depletion, Acid rains, Green Revolution, Population Growth and environmental quality, Environmental Impact Assessment.

UNIT – IV

Environmental acts: Water and air (Prevention and Control of pollution) acts, Environmental protection act, Forest Conservation act. Case Studies: Silent Valley Project, Chipko movement, Narmada Bachao Andolan, Bhopal Tragedy, Mathura Refinery and TajMahal, Chernobyl Nuclear Disaster and Ralegan Siddhi (Anna Hazare).

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

TEXT BOOKS:

1. "Environmental Studies" by Benny Joseph, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. "Comprehensive environmental studies"- JP Sharma, Laxmi Publications.

REFERENCE BOOKS:

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

Engineering Graphics

(Common for all branches)

I B.Tech – II Semester (Code: 14EG206 / 14EG106)

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

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

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

UNIT – II

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

UNIT – III

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

UNIT – IV

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

UNIT – V

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

REFERENCE BOOKS:

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

Chemistry Laboratory

(Common for all branches)

SUB CODE: 14CYL201 / 14CYL101

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF EXPERIMENTS

1. **Introduction to Chemistry Lab** (the teachers are expected to teach fundamentals like Calibration of Volumetric Apparatus, Primary, Secondary Solutions, Normality, Molarity, Molality etc. and error, accuracy, precision, theory of indicators, use of volumetric titrations).
2. **Volumetric Analysis:**
    a. Estimation of acid content in un-known solution
    b. Estimation of Active Chlorine Content in Bleaching Powder
    c. Estimation of Mohr's salt by permanganometry.
3. **Analysis of Water:**
    a. Estimation of total hardness of ground water sample by EDTA method
    b. Estimation of Alkalinity of water.
    c. Estimation of Dissolved oxygen in water.
4. **Estimation of properties of oil**:
    a. Estimation of Acid Number
    b. Estimation of Saponification value
5. **Preparations:**
    a. Preparation of Soap
    b. Preparation of Urea-formaldehyde resin
    c. Preparation of Phenyl benzoate
6. **Demonstration Experiments (Any two of the following):**
    5.1 Determination of dissociation constant of weak acid by pH meter.
    5.2 Determination of conductivity of given sample by conductometer
    5.3 Determination of Mohr's salt/Iron by potentiometric method

TEXT BOOKS:

1. "Practical Engineering Chemistry" by K.Mukkanti, Etal, B.S. Publicaitons, Hyderabad.
2. Inorganic quantitative analysis, Vogel.

REFERENCE BOOK:

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

English Communication Skills Laboratory

(Common for all branches)

SUB CODE: 14ELL202 / 14ELL102

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Communication Skills: Introduction to Communication, differences between communication and communication skills, Types of communication: Verbal and Non-Verbal, Barriers to communication, LSRW Skills.

UNIT – II

Functional English: Small talk, Conversation Starters, Greeting, Parting, Offering, Requesting, Daily activities, Asking about activities, General activities, Meeting at Railway Station, Asking Questions at railway station, Getting Information at Airport, Asking Directions, Finding one's way, Asking about busses, Travelling by Bus, Going by Taxi, Taking A Trip by Car, Arriving Early or Late, Using the Telephone, Getting Help in stores, Going Shopping, Talking about shopping, Shopping for Clothes, Asking about Prices, Talking About money, Shopping for Groceries, Talking about eating, Ordering food, Personal Health and Common health problems, At the Doctor's office.

UNIT – III

Phonetics (Oral drills), British English and American English, Stress and Rhythm, intonation

UNIT – IV

Vocabulary Development: Classified Vocabulary, Word Roots, Prefixes and Suffixes Idioms (100) and Phrasal verbs (100), Homonyms, Homophones, Homographs and Eponyms and One word Substitutes.

UNIT – V

Oratory Skills: JAM, Elocution

UNIT – VI

Manners and Etiquette: Giving & Receiving Feedback, Telephone &E-mail Etiquettes, and Gender Sensitive Language, Discussion forum, web notes.

REFERENCE BOOKS:

1. **New Interchange**, 3rd Edition by Jack C Richards, Cambridge University Press.
2. **English Conversation Practice** by Grant Taylor, Mc Graw Hill
3. **English Vocabulary in Use** by Micheal Mc Carthy, Felicity O dell.

Software:

Buzzers for conversations, New Interchange series.
English in Mind series, telephoning in English.
Speech Solutions, A course in Listening and Speaking.
Face to Face series.

Workshop

(Common for all branches)

SUB CODE: 14WSL203 / 14WSL103

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF EXPERIMENTS

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

ENGINEERING MATHEMATICS – III
SUB CODE: 14EC301/14MA301

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

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

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

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

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 by Erwin Kreyszig, 9th edition, John Wiley & Sons.

REFERENCE BOOK:

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

DATA STRUCTURES USING C
SUB CODE: 14EC302

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT I

Arrays, Searching and Sorting: Applications of arrays, bubble sort, selection sort, quick sort, insertion sort, merge sort, radix sort, shell sort, heap sort, linear search, binary search, hashing, hashing functions.

Linked Lists: Concepts of linked lists, operations performed on singly linked list, doubly linked list, circular linked list.

UNIT II

Stacks: Basic concepts of stacks, implementation of stacks using arrays and linked list, stack applications such as infix to postfix expression conversion, evaluation of postfix expressions.

Queues: Basic concepts of queues, implementation of queues using arrays and linked list, circular queue, applications.

UNIT III

Trees: The concept of tree, Binary tree and its representation, Binary tree traversal, Binary search tree, Counting the number of nodes in a binary search tree, Searching for a target key in a binary search tree, deletion of a node from a binary search tree, AVL trees, operation performed on AVL trees.

UNIT IV

Graphs: Representations of graphs, Computing in-degree and out-degree of a node of a graph using adjacency matrix representation, Depth first traversal, Breadth first traversal, connected component of a graph, Depth first spanning tree, Breadth first spanning tree, Minimum cost spanning tree.

TEXT BOOK:

1. Data Structures using C by Kashi NathDey and Samir Kumar Bandyopadhyay, Pearson Education India, 2009.

REFERENCE BOOKS:

1. Data Structures using C by E. Balagurusamy, Tata McGraw-Hill Education, 2013.
2. Data Structures using C by Krishna Moorthy, Tata McGraw-Hill Education, 2010.
3. Data Structures and Algorithm Analysis in C, Second Edition, Mark Allen Weiss, Pearson Edition, 2006.

ELECTRONIC DEVICES
SUB CODE: 14EC303

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT- I

Transport Phenomena in Semiconductors: Mobility and Conductivity, Electrons and holes in an Intrinsic Semiconductors, Donor and Acceptor impurities, Charge densities in a Semiconductor, Hall effect, Generation and Recombination of Charges, Diffusion, Continuity Equation, Injected Minority Carrier charge, The potential variation within a Graded Semiconductor, Energy Density, Fermi Dirac Function, Carrier Concentrations in an Intrinsic semiconductor, Fermi level in Intrinsic and Extrinsic Semiconductors, Band structure of an open circuit p-n junction, Basic Semiconductor equations.

UNIT- II

Junction Diode Characteristics: The Open circuited P-N Junction, The P-N Junction as a Rectifier, The Current components in P-N Diode, The P-N Diode Volt-Ampere equation, The Temperature Dependence of P-N characteristics, Diode Resistance(Static and Dynamic), Space Charge Capacitance, Diffusion Capacitance.

Special Diodes: Varactor Diode, Break Down diodes, Tunnel Diode, V-I characteristics of Tunnel Diode with the help of Energy Band Diagrams, Photo Diode, Light emitting diode.

UNIT- III

Transistors Characteristics: The Junction transistor, Transistor current components, Transistor as an amplifier, Common Base Configuration, Common Emitter Configuration, CE cutoff region, CE Saturation region, CE current gain, Common Collector Configuration, Photo Transistor.

Field Effect Transistors:

The Junction Field Effect Transistor, Pinch-Off voltage, JFET V-I Characteristics, FET Small signal model, Metal-Oxide-Semiconductor FET.

UNIT-IV

Transistor Biasing and Thermal Stabilization : Operating point, Bias Stability, Self Bias, Stabilization against variations in I_{CO}, V_{BE}, and β, Bias Compensation, Thermistor and Sensistor compensation, Thermal runaway, Thermal stability.

PNPN and Other Devices: SCR, DIAC, TRIAC, UJT, and The Phototransistor (their characteristics only).

TEXT BOOKS:

1. Integrated Electronics-Jacob Millman, Chritos C. Halkies,Tata Mc-Graw Hill, 2009.
2. Electronic Devices and Circuits – Salivahanan, Kumar, Vallavaraj, Tata McGraw Hill, Second Edition.

REFERENCE BOOKS:

1. Electronic Devices and Circuits – J. Millman, C. C. Halkias, Tata Mc-Graw Hill.
2. Robert L Boylested and Louis Nashelsky, Electronic Devices and Circuit Theory, 8th Edition, PHI, 2003.

SIGNALS AND SYSTEMS
SUB CODE: 14EC304

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT-I

Introduction: Signals and systems defined, types of signals, systems.

Mathematical description of Continuous–Time Signals: Functions and functional notation, signal functions, scaling and shifting, differentiation and integration, even and odd functions, periodic functions, signal energy and power.

Properties of Continuous –Time systems: Block diagram and system terminology, system modeling, system properties.

UNIT-II

Time-Domain Analysis of Continuous-Time Systems: The convolution integral, block diagram realization of differential equations.

The Continuous-Time Fourier Systems: Periodic excitation and response of LTI systems, Basic concepts and development of the Fourier series, Numerical computation of the Fourier series, convergence of the Fourier series, properties of the Fourier series, band limited signals, responses of LTI systems with periodic excitation.

UNIT-III

The Continuous-Time Fourier Transform: Aperiodic excitation and response of LTI systems, Basic concepts and development of the Fourier transform, Convergence and the generalized Fourier transform, Numerical computation of the Fourier transform, Properties of the continuous time Fourier transform.

Continuous-Time Fourier Transform analysis of signals and systems: Frequency response, Ideal filters, Practical passive filters.

UNIT-IV

Sampling: Representing a continuous time signal by samples, Impulse sampling.

Correlation, Energy Spectral Density and Power Spectral Density: correlation and the correlogram, autocorrelation, cross correlation, correlations and the Fourier series, energy spectral density, power spectral density.

TEXT BOOK:

1. Fundamentals of Signals and Systems, 2nd Edition, Michael J Roberts, Govind Sharma, Tata McGraw Hill, 2010.

REFERENCE BOOKS:

1. Signals and Systems, Simon Haykin, John Wiley, 2004.
2. Signals and Systems, A V Oppenheim, A S Wilsky& IT Young, PHI/ Pearson, 2003.
3. Signals, Systems and Communications, B P Lathi, BSP, 2003.

DIGITAL ELECTRONICS
SUB CODE: 14EC305

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Binary Systems: Complements: The r's complement, The (r-1)'s complement, subtraction using method of complements. **Binary codes:** Decimal codes, Reflected code, Error detecting codes, Alphanumeric codes.

Sign magnitude representation: Signed Magnitude form, Signed 1's complement form, Signed 2's complement form.

Boolean Algebra and Logic Gates: Basic definitions, Axiomatic definitions of Boolean algebra, Basic Theorems and properties of Boolean algebra, Boolean functions. Canonical and standard forms, Digital Logic gates.

UNIT – II

Simplification of Boolean Functions: The map method, Two-and Three-variable Maps, Four variable Maps, Five variable Maps, POS simplification, NAND and NOR implementation, Other Two-level implementations, Don't care conditions, The Tabulation Method, Determination of prime - implicants, Selection of prime –implicants.

Combinational Logic: Introduction, Design procedure, Adders, Subtractors, Code conversion, Multilevel NAND circuits, Multilevel NOR circuits, EX-OR and EX-NOR circuits.

UNIT – III

Combinational Logic with MSI and LSI: Binary parallel adder, Carry propagation, Decimal adder, Magnitude comparator, Decoders, Demultiplexers, Encoders, Multiplexers.

Sequential Logic: Flip-flops, Triggering of Flip-Flops, Analysis of clocked Sequential Circuits, state reduction and assignment, Flip-Flop excitation tables, Conversions of Flip-Flops, Design of Sequential circuits.

UNIT – IV

Registers, Counters and Memory Unit: Registers, shift registers, Ripple counters, Synchronous counters.

Digital Integrated Circuits: Introduction, Characteristics of logic families, RTL and DTL circuits, I^2 L, TTL, MOS, CMOS Logic families.

Programmable Logic Devices: PLA, PAL, ROM.

TEXT BOOK:

1. Digital Logic and Computer Design, M Morris Mano, PHI/Pearson Education, 2003.

REFERENCE BOOKS:

1. Digital Integrated Electronics, Taub and Schilling, Mc-Graw Hill, 1977.
2. Fundamental of Digital Circuits, A.Anand Kumar, Pearson Education, 4th Edition.

CIRCUIT THEORY
SUB CODE: 14EC306

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT-I

Voltage and current Laws: Introduction, nodes, paths, loops and branches, Kirchhoff's current and voltage laws, series and parallel connected sources, resistors in series and parallel, voltage and current division.

Basic Nodal and Mesh Analysis: Nodal analysis, The super node, Mesh analysis, The super mesh, Nodal vs. Mesh analysis: A comparison.

Network Topology: Introduction, formation of Incidence matrix, Tieset matrix formation, Cutset matrix formation.

UNIT II

Useful circuit analysis techniques: Linearity and superposition, source transformations, Thevenin and Norton equivalent circuits, maximum power transfer Theorem, Reciprocity Theorem Millman's Theorem, Compensation Theorem, delta-wye conversion, selecting an approach: A comparison of various techniques.

Basic RL and RC Circuits: The source free RL circuit, properties of the exponential response, the source free RC circuit, driven RL circuits, natural and forced response, driven RC circuits.

UNIT III

The RLC Circuit: The source free Parallel circuit, The over damped Parallel RLC circuit, Critical damping, The under damped parallel RLC circuit, The complete response of the RLC circuit.

Sinusoidal steady state Analysis: Characteristics of sinusoids, forced response to sinusoidal functions, the complete forcing function, the phasor, phasor relationships for R, L and C, impedance, admittance, phasor diagrams.

AC circuit Power analysis: Instantaneous power, average power, effective values of current and voltage, apparent power and power factor, complex power, comparison of power terminology.

UNIT IV

Complex frequency and the Laplace transform: complex frequency, the damped sinusoidal Forcing function, Definition of the Laplace Transform, Laplace transform of simple time functions, inverse transform techniques, basic theorems for the Laplace transforms, initial and final value theorems.

Frequency Response: Parallel Resonance, Bandwidth and High Q circuits, Series resonance, other resonant forms, scaling.

TEXT BOOK:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, Engineering Circuit Analysis, 7th Edition, Tata McGraw Hill, 2012.

REFERENCE BOOKS:

1. Circuits & Networks: Analysis and Synthesis, A.Sudhakar and Shyammohan S.Pilli, Tata McGraw Hill, 2007.
2. Network Analysis, M. E. Vanvalkenburg, 3rd Edition, PHI, 2003.

DATA STRUCTURES LAB
LAB CODE: 14ECL301

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF LAB PROGRAMS

1. C program to implement insertion sort, bubble sort techniques.
2. C program to implement merge sort, radix sort.
3. C program to implement selection sort, quick sort techniques.
4. C program on linear search and binary search.
5. C program to perform the following operations on Singly Linked List
   i. Creation ii. Insertion iii. Deletion
   iv. Traversal v. Search vi. Display
6. C program to perform the following operations on Doubly Linked List
   i. Creation ii. Insertion iii. Deletion
   iv. Traversal v. Search vi. Display
7. C program to perform the following operations on Circular Linked List
   i. Creation ii. Insertion iii. Deletion
   iv. Traversal v. Search vi. Display
8. C programs to implement stacks using arrays and linked lists.
9. C programs to implement queues using arrays and linked lists.
10. C program to convert the given infix expression into postfix.
11. C program to evaluate postfix expressions.
12. C program on B tree.
13. C program on B+ tree.
14. C program to perform Binary Tree traversal operations.
15. C programs to perform Binary search tree operations.

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.

ELECTRONIC DEVICES LAB
LAB CODE: 14ECL302

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF LAB EXPERIMENTS

1. Characteristics of Silicon and Germanium diodes.
2. Characteristics of Zener diode and its regulation characteristics.
3. Characteristics of BJT in Common Base configuration.
4. Characteristics of BJT in Common Emitter configuration.
5. Characteristics of Emitter follower circuit.
6. Output and Transfer Characteristics of JFET.
7. Characteristics of UJT.
8. Design and verification of self bias circuit for BJT.
9. Design and verification of collector to base bias circuit for BJT.
10. Design and verification of Fixed bias circuit for BJT.
11. Voltage Regulator using BJT.
12. Characteristics of SCR.
13. Study of CRO.
14. Characteristics of Triac.
15. Characteristics of Photo Transistor.

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.

DIGITAL ELECTRONICS LAB
LAB CODE: 14ECL303

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF LAB EXPERIMENTS

1. Realization of Gates using Discrete Components.
2. Realization of Gates using Universal Building Block (NAND only).
3. Design of Combinational Logic Circuits like Half – adder, Full – adder, Half–subtractor and Full-Sub tractor.
4. Verification of 4-bit Magnitude Comparator.
5. Design of Encoders like 4:2 and 8:3 encoder.
6. Design of Decoders like BCD – Decimal decoder.
7. Design of Code Converters (Binary to Gray).
8. Design of Multiplexers/De Multiplexers.
9. Verification of Truth Table of Flip-Flops using Gates.
10. Design of Shift register (To Verify Serial to parallel, parallel to Serial, Serial to Serial and parallel to parallel Converters) using Flip-Flops.
11. Design of Ring & Johnson Counters using Flip-Flops.
12. Conversion of Flip-Flops (JK-T, JK – D).
13. Design of Binary/Decade Counter.
14. Design of Asynchronous Counter, Mod Counter, Up Counter, Down Counter & Up/Down Counter.
15. Design of Synchronous Counter, Mod Counter, Up Counter, Down Counter & Up/Down Counter.

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.

ENGINEERING MATHEMATICS – IV
SUB CODE: 14EC401/14MA401

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Complex numbers and functions: Introduction to Complex Numbers, Complex Plane, Polar form of Complex numbers, Powers and roots, Derivative, Analytic Function, Cauchy - Riemann Equations, Laplace's equation.

Complex Integration: Cauchy's Integral Theorem, Cauchy's Integral Formula.

UNIT – II

Taylor, Laurent series and Residue Integration: Taylor Series (without proof) and Maclaurin series, Laurent Series (without proof), singularities and zeros, infinity, Residue Integration method, Evaluation of real integrals.

UNIT – III

Probability Densities: Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Joint Distributions, Discrete and Continuous.

Sampling Distribution: Populations and Samples, Sampling Distribution of the Mean (σ known), Sampling Distribution of the Mean (σ Unknown), Sampling Distribution of the Variance.

UNIT – IV

Inferences Concerning Means: Point Estimation, Interval Estimation, Tests of Hypotheses, Null Hypotheses and significance of tests, Hypotheses Concerning one Mean, Inferences Concerning Two Means.

Inferences Concerning Variances: Estimation of Variances, Hypotheses Concerning One Variance, Hypotheses Concerning Two Variances.

Inferences Concerning Proportions: Estimation of Proportions, Hypotheses Concerning One Proportion.

TEXT BOOKS:

1. Advanced Engineering Mathematics by Erwin Kreyszig, 9th Edition, John Wiley, 2000.
2. Probability and Statistics for Engineers by Miller & Freund's, Richard A. Johnson, 8th Edition, PHI.

REFERENCE BOOK:

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

ELECTRONIC CIRCUITS-1
SUB CODE: 14EC402

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Rectifiers: Half wave, Full wave and Bridge Rectifiers without filter and with inductor filter, Capacitor filter, L section and π- section filters.

BJT at low frequency: Transistor Hybrid model, Determination of h parameters from Characteristics, 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.

UNIT-II

FET at low frequency: FET small signal model, CS / CD / CG configurations at low frequencies.

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.

TEXT BOOKS:

1. Electronic Devices and Circuits by S.Salivahanan and N.Suresh Kumar, 3rd Edition, Tata McGraw-Hill Education, 2012.
2. Integrated Electronics: Analog and Digital Circuits and Systems by Jacob Millman and Christos C Halkias, Tata McGraw-Hill Education, 2003.

REFERENCE BOOKS:

1. Basic Electronics and Linear Circuits by N.N.Bhargava, DC Kulshrestha and SC Gupta, TTTI Series, Tata McGraw-Hill Education, 2003.
2. Electronic Devices and Circuits by Theodore F Bogart Jr., Jeffrey S Beasley and Guillermo Rico, 6th Edition, Pearson Education, 2004.

ELECTROMAGNETIC FIELD THEORY
SUB CODE: 14EC403

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Electrostatics –I:

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, Guass's law , Applications of Gauss law, Divergence, Maxwell's First equation (Electrostatics), Energy expended in moving a point charge in an electric field, The line integral, Definition of potential and potential difference. The potential field of a point charge, system of charges, potential gradient, the dipole and Energy density in electrostatic field.

UNIT – II

Electrostatics – II:

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 Laplace'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.

The Uniform Plane Wave: Wave propagation in free space, dielectrics. Poynting theorem and wave power. Propagation in good conductors: skin effect. Wave polarization.

TEXT BOOK:

1. W H Hayt, J A Buck, J Akhtar Engineering Electromagnetics, 8th Edition McGraw Hill Education, 2014.

REFERENCE BOOKS:

1. Mathew NO Sadiku, Elements of Electromagnetics, Oxford University Press, 2003.
2. Joseph A Edminister, Theory and Problems of Electromagnetics, 2nd Edition, Schaum's Outline Series, Mc-Graw Hill International, 1993.
3. EC Jordan and KG Balmain, Electromagnetic Waves and Radiating Systems, 2nd Edition, Prentice Hall of India.

ANALOG COMMUNICATIONS
SUB CODE: 14EC404

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Amplitude Modulation: Amplitude Modulation, Virtues, Limitations, and Modifications of Amplitude Modulation, Double Sideband- Suppressed Carrier Modulation, Costas Receiver, Quadrature Carrier Multiplexing, Single-Sideband Modulation, Vestigial Sideband Modulation, Baseband Representation of Modulated Waves and Band-Pass Filters.

UNIT– II

Angle Modulation: Basic Definitions, Properties of Angle Modulated Waves, Relationship between PM and FM waves, Narrow-Band Frequency Modulation, Wide-Band Frequency Modulation, Transmission Bandwidth of FM waves, Generation of FM waves, Demodulation of FM signals.

UNIT – III

Pulse Modulation: Sampling Process, Pulse-Amplitude Modulation, Pulse-Position Modulation.

Random Signals and Noise: Probability and random variables, Expectation, Transformation of random variables, Gaussian Random Variables, The Central Limit Theorem, Random Processes, Correlation of Random Processes, Spectra of Random Signals, Gaussian Processes, White Noise.

UNIT – IV

Noise in Analog Communications: Noise in Communication Systems, Signal to Noise ratios, Band-Pass Receiver Structures, Noise in Linear Receivers Using Coherent Detection, Noise in AM Receivers Using Envelope Detection, Noise in SSB Receivers, Detection of Frequency Modulation, FM Pre-Emphasis and De-Emphasis.

TEXT BOOK:

1. Introduction to Analog and Digital Communications by Simon Haykin, Michael Moher, John Wiley and Sons, 2nd Edition, 2007.

REFERENCE BOOKS:

1. Principles of Communication Systems by Taub and Schilling, Tata McGraw-Hill Education, 2nd Edition, 1986.
2. Analog and Digital Communication Systems by Sam Shanmugam, John Wiley and Sons, 1992.

NETWORK ANALYSIS AND SYNTHESIS
SUB CODE: 14EC405

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

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 Network Parameters : Two port network, Open circuit impedance, Short circuit admittance (Y), Transmission, Inverse transmission, Hybrid and inverse hybrid parameters, Relation between parameter sets, Interconnection of two port networks, Lattice networks, Image parameters.

UNIT – II

Filters : Characteristic impedance of symmetrical networks, Properties of symmetrical networks, Filter fundamentals, Pass and stop bands, Characteristics impedance, Constant K low pass filter, Constant K high pass filter, m-derived T section, m-derived π Section, variation of characteristic impedance over the pass band, Termination with m-derived half section, Band pass filters, Filter circuit design, Filter performance.

UNIT – III

Attenuators: Symmetrical and Asymmetrical attenuators, T-type attenuator, π-type attenuator, Lattice attenuator, Bridged T attenuator, L-type attenuator.

Equalizers: Equalizer configuration, Inverse network, Two terminal equalizer, Constant resistance equalizer, Full series equalizer, Full shunt equalizer, Bridged - T equalizer, Lattice equalizer.

UNIT – IV

Network Synthesis: Positive real functions, Positive real function properties, Testing driving point functions, Driving point function synthesis with two LC,RL,RC (Both cauer and foster forms) elements, Two port network synthesis by ladder development, series and parallel realizations.

TEXT BOOKS:

1. Network Analysis by M. E. Vanvalkenburg, 3rd Edition PHI, 2003.
2. Circuits and Networks: Analysis and Synthesis by A. Sudhakar and Shyam Mohan SP, 3rd Edition, Tata McGraw-Hill Education, 2006.

REFERENCE BOOKS:

1. Introduction to Modern Network Synthesis by M. E. Vanvalkenburg, 2nd Edition, Wiley India Ltd, 1986.
2. Network Theory and Filter Design by Vasudev K Atre, 2nd Edition, Wiley Estern, 2002.
3. Networks, Lines and Fields by John D Ryder, 2nd Edition, PHI, 2003.
4. Network Analysis and Synthesis by Franklin F. Kuo, 2nd Edition, Wiley India Ltd., 2005.

BASIC INSTRUMENTATION
SUB CODE: 14EC406

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT-I

Measurement and Error: Definitions, Accuracy and Precision, Significant figures, Types of error, Statistical analysis, Probability of errors, Limiting Errors.

Electromechanical Indicating Instruments: Torque and Deflection of the Galvanometer, Permanent Magnet Moving Coil Mechanism, DC Ammeters, DC Voltmeters, Voltmeter Sensitivity, Series type Ohmmeter, Shunt type Ohmmeter, Calibration of DC Instruments, Alternating Current indicating Instruments.

UNIT-II

Bridge Measurements: Introduction, Wheatstone Bridge, Kelvin Bridge, AC Bridges and their Application-Maxwell Bridge, Hay Bridge, Schering Bridge, Wein Bridge.

Electronic Instruments for measuring Basic Parameters : AC voltmeter using rectifiers, True RMS-Responding voltmeter, Electronic Multimeter, Digital voltmeters, Q Meter, Vector Impedance Meter, Vector Voltmeter, RF Power and Voltage measurement.

UNIT-III

Oscilloscopes: Oscilloscope Block diagram, Cathode Ray Tube, Oscilloscope Techniques. **Special Oscilloscopes**: Storage Oscilloscope, Sampling Oscilloscope, Digital Storage Oscilloscopes.

Signal Analysis: Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analysis. **Frequency Counter and Time-Interval Measurements**: Simple Frequency counter, Display Counter, Time Base, Input Signal Processing, Period Measurement.

UNIT-IV

Transducers as Input Elements to Instrumentation Systems: Classification of Transducers, Selecting a Transducer,Strain gauges, Displacement Transducers, Temperature Measurements.

Analog and Digital Data Acquisition Systems: Instrumentation systems.

TEXT BOOK:

1. Modern Electronic Instrumentation and Measurement Techniques by W.D Cooper & A.D Helfrick PHI, 2008.

REFERENCE BOOKS:

1. A Course in Electrical and Electronics Measurements and Instrumentation by Sawhney. A.K**,** 18th Edition, Dhanpat Rai & Company Private Limited, 2007.
2. Electronic Instrumentation by H S Kalsi, Tata McGraw-Hill Education, 1995.

ELECTRONIC CIRCUITS-1 LAB
LAB CODE: 14ECL401

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF LAB EXPERIMENTS

1. Half Wave Rectifier with and without Filters.
2. Full Wave Rectifier with and without Filters.
3. Bridge Rectifier With and Without Filters.
4. Frequency Response of Common Emitter Amplifier.
5. Frequency Response of Common Source Amplifier.
6. Measurement of Parameters of Emitter Follower and Source Follower; $\mathbf{R_I}$, $\mathbf{A_V}$, $\mathbf{A_I}$&$\mathbf{R_O}$.
7. Cascode Amplifier.
8. Two Stage R.C Coupled Amplifier.
9. Voltage Series Feedback Amplifier.
10. Voltage Shunt Feedback Amplifier.
11. Complementary Symmetry Push-pull amplifier.
12. Class-A Power Amplifier.
13. R.C Phase Shift Oscillator.
14. Colpitt's Oscillators.
15. Hartley Oscillator.

NOTE: A minimum of 10 (Ten) experiments, have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.

ANALOG COMMUNICATIONS LAB
LAB CODE: 14ECL402

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF LAB EXPERIMENTS

1. Amplitude Modulation and Demodulation.
2. DSB SC Modulation and Demodulation.
3. SSB SC Modulation and Demodulation.
4. Frequency Modulation and Demodulation.
5. Pre Emphasis – De Emphasis Circuits.
6. Verification of Sampling theorem.
7. PAM Generation and Reconstruction.
8. PWM: Generation and Reconstruction.
9. PPM: Generation and Reconstruction.
10. Frequency Division Multiplexing.
11. Design of Mixer.
12. Synchronous Detector.
13. Phase Locked Loop.
14. Diode Detector Characteristics.
15. Characteristics of Automatic Gain Control (AGC).

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.

SIGNALS AND SYSTEMS LAB
LAB CODE: 14ECL403

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF LAB PROGRAMS

1. Basic Operations on Matrices.
2. Generation of basic continuous time signals namely unit impulse, step, ramp, exponential and Sinusoidal signals.
3. Generation of basic discrete time signals namely unit impulse, step, ramp, exponential and Sinusoidal signals.
4. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
5. Finding the Even and Odd Parts of Signal or Sequence and Real and Imaginary Parts of Signal.
6. Verification of linearity and time invariance properties of a given continuous /discrete system.
7. Convolution between Signals and Sequences.
8. Autocorrelation and Cross correlation between Signals and Sequences.
9. Verification of Linearity and Time Invariance Properties of a Given Continuous/Discrete System.
10. Computation of Unit Sample, Unit Step and Sinusoidal Responses of the Given LTI System and Verifying its Physical Realizability and Stability Properties.
11. Finding the Trigonometric Fourier Series of a given Signal.
12. Finding the Fourier Transform of a given Signal and plotting its Magnitude and Phase Spectrum.
13. Sampling Theorem Verification.
14. Program to find frequency response of analog LP/HP/BP/BS filters.
15. Program to find the impulse response of a system defined by a difference equation.

NOTE: A minimum of 10 (Ten) Programs have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.

LINEAR INTEGRATED CIRCUITS
SUB CODE: 14EC501

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

OPERATIONAL AMPLIFIERS: Operational amplifier and block diagram representation, op-amp with negative feedback. Block diagram representation of feedback configurations, voltage series feedback amplifier, voltage shunt feedback amplifier, 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-AMPAPPLICATIONS: The summing amplifier, Differential and instrumentation amplifiers, Voltage to current and current to voltage conversion, The Op-amp with complex impedances, Differentiators and integrators, Non Linear Op Amp circuits, Precision rectifiers.

UNIT – II

OSCILLATORS& COMPARATORS: Oscillator principles, Oscillator types, Frequency stability, Phase shift oscillator, Wein bridge oscillator, Quadrature oscillator, Square-wave generator, Triangular wave generator, Saw tooth wave generator, and Voltage controlled oscillator. 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 & negative clampers, Absolute value output circuit, Peak detector, S/H circuit. D/A conversion fundamentals, weighted resistor summing, R-2R Ladder D/A converters, A/D conversion: Ramp type, Successive Approximation, Dual slope converters, Parallel & Tracking A/D converters.

UNIT – IV

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

TEXT BOOKS:

1. Rama Kant A. Gayakwad, Op-Amps & 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.

LINEAR CONTROL SYSTEMS
SUB CODE: 14EC502

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

INTRODUCTION: Basic concept of simple control system, open loop – closed loop control systems. Effect of feedback on overall gain – stability sensitivity. Types of feedback control systems – Linear time invariant, time variant systems and non-linear control systems.

MATHEMATICAL MODELS AND TRANSFER FUNCTIONS OF PHYSICAL SYSTEMS: Differential equations – impulse response and transfer functions – translational and rotational mechanical systems. Transfer functions and open-loop and closed-loop systems. Block diagram representation of control systems – black diagram algebra – signal flow graph – Mason's gain formula

UNIT – II

TIME DOMAIN ANALYSIS: Standard test signals – step, ramp, parabolic and impulse response function, characteristic polynomial and characteristic equations of feedback systems, transient response of first order and second order systems to standard test signals. Time domain specifications – steady state response – steady state error and error constants. Effect of adding poles and zeros on over shoot, rise time, band width, dominant poles of transfer functions. Stability Analysis in the complex plane: Absolute, relative, conditional, bounded input bounded output, zero input stability, conditions for stability, Routh – Hurwitz criterion.

UNIT – III

FREQUENCY DOMAIN ANALYSIS: Introduction – correlation between time and frequency responses – polar plots – Bode plots – Nyquist stability criterion – Nyquist plots. Assessment of relative stability using Nyquist criterion – closed loop frequency response.

UNIT – IV

ROOT LOCUS TECHNIQUE: Introduction – construction of root loci – State space analysis: Concepts of state, state variables and state models – digitalization – solution of state equations – state models for LTI systems. Concepts of controllability and Observability.

TEXT BOOK:

1. I. J. Nagrath & M Gopal, Control Systems Engineering, 3rd edition, New Age International.

REFERENCE BOOKS:

1. Schaum Series, Feedback and Control Systems, TMH.
2. M. Gopal, Control Systems Principles and Design, TMH.
3. John Van de Vegta, Feedback Control Systems, 3rd edition, Prentice Hall, 1993.

ELECTRONIC CIRCUITS - II
SUB CODE: 14EC503

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT I

TRANSISTOR AT HIGH FREQUENCY: Hybrid-π CE transistor model, Hybrid-π Conductance's, Hybrid-π Capacitances, 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. **WAVE SHAPING CIRCUITS&REGULATED POWER SUPPLIES:** Diode clippers, clampers and slicers, 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 BOOKS:

1. Donald L. Schilling and Charles Belove, Electronic Circuits-Discrete and Integrated, 3rd Edition, TMH, 2002.
2. Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, PEARSON 10th Edition.

EM WAVES AND TRANSMISSION LINES
SUB CODE: 14EC504

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT I

REFLECTION AND TRANSMISSION OF PLANE WAVES: Reflection and Transmission at a general dielectric interface: Normal incidence, Reflection and transmission at an interface: oblique incidence on a conductor, Oblique incidence on dielectric interfaces, reflection and transmission for layered materials at normal incidence, applications.

UNIT II

THEORY OF TRANSMISSION LINES: The transmission line, transmission line parameters, the transmission line equations, types of transmission lines, the field approach to transmission lines, finite transmission lines, power relations on a general transmission line, resonant transmission line circuits, applications.

UNIT III

THE SMITH CHART, IMPEDANCE MATCHING AND TRANSMISSION LINE CIRCUITS: Smith Chart, The Smith Chart as an Admittance Chart, impedance matching and the Smith Chart, Quarter wavelength transformer matching.

TRANSIENTS ON TRANSMISSION LINES: Propagation of narrow pulses on finite, lossless transmission lines, propagation of narrow pulses on finite, distortion less transmission lines, Transients on transmission lines: long pulses, Transients on transmission lines: Finite length pulses, reflections from discontinuities, transients on lines with reactive loading, initial conditions on line.

UNIT IV

WAVEGUIDES: The concept of a waveguide, Transverse Electromagnetic, Transverse Electric, Transverse Magnetic waves, TE propagation in parallel plate waveguides, TM propagation in parallel plate waveguides, Rectangular Waveguides, Circular Waveguides, TE and TM modes and their characteristics.

TEXT BOOKS:

1. Engineering Electromagnetic by Ida, Second Edition, Springer Publications (BSP Publications).
2. Microwave & Radar Engineering, M. Kulkarni, Umesh Publications, 3r^{d} edition. (For circular waveguides only)

REFERENCE BOOKS:

1. Electromagnetic waves by R. K. Shevgaonkar, Tata McGraw Hill.
2. P. A. Rizzi, Micro Wave Engineering: Passive Circuits, PHI, 2002.

DIGITAL COMMUNICATIONS
SUB CODE: 14EC505

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

PULSE MODULATION: Quantization Process, Quantization Noise, Pulse Code Modulation: Encoding, Regeneration, Decoding, Delta Modulation, Differential Pulse Code Modulation.

BASE BAND PULSE TRANSMISSION: Matched filter, Properties, Intersymbol interference, Correlative level coding, Nyquist's criterion for distortion less baseband binary transmission, Ideal Nyquist channel, Raised cosine spectrum, Duo binary & Modified Duo binary signaling.

UNIT – II

DIGITAL PASSBAND TRANSMISSION: Introduction, Pass band transmission model, Gram Schmidt Orthogonalization procedure, Geometric interpretation of signals, Coherent detection of signals in noise, Probability of error, Correlation receiver, detection of signals with unknown phase, Coherent BPSK, QPSK, BFSK, Non Coherent BFSK, DPSK.

UNIT – III

INFORMATION THEORY: Uncertainty, Information, Entropy, Properties of Entropy, Source Coding Theorem, Shannon Fano Coding, Huffman Coding, Discrete memory less channels, Mutual information, Properties, Channel capacity, Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Information capacity theorem.

UNIT – IV

ERROR CONTROL CODING: Linear Block Codes, Hamming Codes, Cyclic Codes, Convolution codes.

SPREAD SPECTRUM TECHNIQUES: PN Sequences, Notion of Spread Spectrum, DSSS: DSSS with CBPSK, Processing gain, Probability of error, Acquisition and tracking, FHSS: Slow frequency hopping, Fast frequency hopping.

TEXT BOOKS:

1. Simon Haykin, Communication Systems, 3rd Edition, John Wiley & Sons.
2. Bernard Sklar, Digital Communication, 2nd Edition, Pearson Education, 2001.

REFERENCE BOOK:

1. Taub and Schilling, Principles of Communication Systems, 2nd Edition, TMH, 1986.

PULSE AND SWITCHING CIRCUITS
SUB CODE: 14EC506A

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

LINEAR WAVE SHAPING

The high- pass RC circuit, Response of RC high- pass circuit to sinusoidal, step, pulse, square-wave, exponential and ramp input, The high-pass RC circuit as a differentiator, Double differentiation, low-pass RC circuit, Response of RC low-pass circuit to sinusoidal, step, pulse, square-wave, exponential and Ramp inputs, The low-pass RC circuit as an integrator, Attenuators, RL circuits, RLC Circuits, Ringing circuit.

UNIT – II

NON-LINEAR WAVE SHAPING : Clipping (Limiting) circuits, Diode clippers, Clipping at two independent levels, Comparators, Breakaway diode and amplifier, Diode-differentiator comparator, Applications of voltage comparators, The clamping operation, clamping circuit taking source and diode resistances into account, A clamping circuit theorem, Practical clamping circuits, The transistor as a switch.

UNIT – III

BISTABLE MULTIVIBRATORS : The stable states of a binary, A fixed bias transistor binary, A self-biased transistor binary, Commutating capacitors, Methods of improving resolution, Unsymmetrical triggering of the binary, Triggering Unsymmetrically through a unilateral device, Symmetrical triggering, Direct –connected binary circuit, Schmitt Trigger circuit, Emitter- coupled binary.

MONOSTABLE AND ASTABLE MULTIVIBRATORS : The Monostable multivibrator, Gate width of a collector-coupled monostable multivibrator, Waveforms of the collector-coupled monostable multivibrator, Gate width of an emitter-coupled monostable multivibrator, Triggering of the monostable multivibrator, The monostable circuit adjusted for free-running operation, Astable collector- coupled multivibrator.

UNIT –IV

VOLTAGE TIME BASE GENERATORS: General features of a time- base signal, Exponential sweep circuit, A fixed- amplitude sweep ,A transistor constant- current sweep, Miller and Bootstrap time-base generators-general considerations, The transistor Miller time-base generator, Bootstrap time -base generators-Basic principles, The transistor Bootstrap time-base generator.

CURRENT TIME-BASE GENERATORS: A simple current sweep, Linearity correction through adjustment of driving waveform, a transistor current time -base generator.

TEXT BOOK:

1. J Millman and H Taub, Pulse, Digital and Switching Circuits, TMH, 2003.

REFERENCE BOOKS:

1. J Millman and H Taub, Mothiki S. Prakash Rao, Pulse Digital & Switching Waveforms, 2nd Edition, TMH.
2. David A Bell, Solid State Pulse Circuits, 4th Edition, PHI 2003.

PROBABILITY AND STOCHASTIC PROCESS
SUB CODE: 14EC506B

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT I

PROBABILITY THEORY: Probability and axioms of probability, Joint Probability and Conditional Probability, Total Probability, Baye's Theorem and Bernoulli's trials.

SINGLE RANDOM VARIABLES: Definition of a Random variable, Classification of Random variables, Distribution and Density functions- Gaussian, Uniform, Exponential, Binomial, Poisson's, Rayleigh, Chi square, Conditional distributions and density functions.

UNIT II

OPERATIONS ON SINGLE RANDOM VARIABLE: Expectation, Moments about the origin, Central Moments, Variance, Skew and Kurtosis, Chebyshev's Inequality, Markov Inequality, Characteristic functions, Moment Generating function, Transformation of random variables.

MULTIPLE RANDOM VARIABLES: Joint Distribution Function and its Properties, Joint Density and its Properties, Marginal Distribution and Density Functions, Conditional Distribution and Density – Point Conditioning and Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem.

UNIT III

OPERATIONS ON MULTIPLE RANDOM VARIABLES: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Schwartz Inequality, Joint Characteristic Functions, Jointly Gaussian Random Variables & properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

RANDOM PROCESSES-TEMPORAL CHARACTERISTICS: Random Process Concept, Classification of Random Processes, Distribution and Density Functions, Stationarity and Statistical Independence. Ensemble Averages, Time Averages, Mean - Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions.

UNIT IV

RANDOM PROCESSES-SPECTRAL CHARACTERISTICS: Power Density Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function, Cross-Power Density Spectrum and its Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

LINEAR SYSTEMS WITH RANDOM INPUTS: Linear system Fundamentals, Random signal response of linear systems, System evaluation using random noise, spectral characteristics of system response.

TEXT BOOKS:

1. Peyton Z. Peebles, Probability Random variables and Random signal principles 4th Edition, TMH, 2009.
2. Athanasios Papoulis and Unni Krishna Pillai, Probability, Random variables and stochastic processes, 4th Edition, PHI, 2009.

LINEAR ALGEBRA
SUB CODE: 14EC506C

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT I

LINEAR SYSTEM OF EQUATIONS: Gaussian Elimination, Echelon forms, existence/Uniqueness/Multiplicity of solution.

VECTOR SPACES: Definition, Subspaces, linear dependence, spanning sets, Basis, dimension, Four fundamental subspaces associated with a matrix, revisit the system of linear equations, Intersection and Sum of Subspaces, Direct Sums, Embedding of sub- spaces.

UNIT II

LINEAR TRANSFORMATIONS: Definition, Matrix representations, Change of Basis, Similarity transformations, Invertible transformations.

UNIT III

INNER PRODUCTS: Definition, induced norm, inequalities, Orthogonality, Gram-Schmidt orthogonalization process, Orthogonal projections, rank-one projections, Unitary transformations, isometry.

UNIT IV

EIGEN DECOMPOSITION: Eigen vectors, Eigen Values, Gershgorin circles, Characteristic polynomial, Eigen spaces, Diagonalizability conditions, Invariant subspaces, Spectral theorem, Rayleigh quotient.

TEXT BOOKS:

1. G. Strang, Linear Algebra and its applications, 3rd Edition.
2. C. D. Meyer, Matrix analysis and applied linear algebra, SIAM, 2000.

REFERENCE BOOKS:

1. D. C. Lay, Linear algebra and its applications, Pearson, 3rd edition.
2. S. H. Friedberg, A. J. Insel, L. E. Spence, Linear Algebra, 4th Edition, PHI, 2003.

DISCRETE MATHEMATICS
SUB CODE: 14ECL506D

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Foundations: Sets, Relations and Functions, Fundamentals of Logic, Logical Inferences, Methods of Proof of an implication, First order Logic & Other methods of proof, Rules of Inference for Quantified propositions, Mathematical Induction.

UNIT – II

Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with repetitions, Enumerating Permutation with Constrained repetitions.

Recurrence relations: Generating functions of sequences, Calculating Coefficients of Generating Functions.

UNIT – III

Recurrence Relations: Solving recurrence relations by Substitution and generating functions. The methods of characteristic roots, solutions of inhomogeneous recurrence relations.

Relations and digraphs: Special properties of binary relations, Operations on relation.

UNIT – IV

Ordering relations, Lattice, Paths and Closures, Directed Graphs and Adjacency Matrices, Application: Topological Sorting.

Graphs: Basic Concepts, Isomorphism's and Subgraphs, Planar Graphs, Euler's Formula; Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four Color Problem.

TEXT BOOK:

1. Toe L. Mott, Abraham Kandel & Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, PHI 2nd edition.

REFERENCE BOOKS:

1. C.L. Liu, Elements of Discrete Mathematics.
2. Rosen, Discrete Mathematics.

PSPICE LAB
LAB CODE: 14ECL501

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF PROGRAMS

1. Low pass and High pass filters
2. Half wave and Full wave rectifiers.
3. Common Emitter Configuration (CE).
4. Common Source Configuration (CS).
5. Common Collector Configuration (CC).
6. Wein Bridge Oscillator.
7. Class-A Power Amplifier.
8. Pre-emphasis and De-emphasis.
9. Clippers.
10. Clampers.
11. RC Coupled Amplifier.
12. Voltage Regulator.
13. Attenuators.
14. Differential Amplifiers.
15. Logic Gates.

NOTE: A minimum of 10 (Ten) programs are to be executed and recorded to attain eligibility for Semester End Examination.

INTEGRATED CIRCUITS LAB
LAB CODE: 14ECL502

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF LAB EXPERIMENTS

1. Measurement of Op-amp Parameters.
2. Applications of Op-amp (Adder, Subtractor, Integrator, Differentiator).
3. Design of Full Wave Rectifier using Op-Amp.
4. Design of Low Frequency Oscillators using Op-Amp (Wein Bridge & RC Phase Shift Oscillators).
5. Waveform Generation using Op-amp (Square, Triangular).
6. Instrumentation Amplifier using Op-AmpIC741.
7. Design and Verification of Schmitt Trigger using Op-AmpIC741.
8. Design of Active Filters (First Order LPF&HPF).
9. Design of State Variable Filter using Op-Amps.
10. Applications of 555 Timer ICs (Astable, Monostable, Schmitt Trigger).
11. PLL using IC 556.
12. Design of Fixed Voltage Regulators.
13. Design of Variable Voltage Regulator using IC 723.
14. Design of VCO using IC 566.
15. Design of 3 bit DAC using R-2R Ladder Network.

NOTE: A minimum of 10 (Ten) experiments, choosing 5 (Five) from each part, have to be Performed and recorded by the candidate to attain eligibility for Semester End Examination.

DIGITAL COMMUNICATIONS LAB
LAB CODE: 14ECL503

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF EXPERIMENTS

Experiments based on Hardware:

1. Generation and Detection of PCM.
2. Generation and Detection of FSK.
3. Generation and Detection of PSK.
4. Generation and Detection of TDM
5. Delta Modulation and Demodulation.

Simulation Experiments:

6. Design a Huffman code for an information source with probabilities p = {0.1, 0.05, 0.21, 0.07, 0.02, 0.2, 0.2, 0.15}. Determine the efficiency of the code by computing the average codeword length and the entropy of the source.
7. Generate the basic pulse shapes, NRZ, RZ, half sinusoid and raised cosine pulses. Generate eye diagrams of binary polar signaling.
8. Write a program to generate any digital modulation (ASK, PSK, FSK) and demodulation scheme.
9. Determine the output of a convolution encoder when the information sequence is 10011100110000111.
10. Find all the code words of the (15, 11) Hamming code and verify that the minimum distance is equal to 3.

NOTE: A minimum of 10 (Ten) experiments, choosing 5 (Five) from each part, have to be Performed and recorded by the candidate to attain eligibility for Semester End Examination.

PROFESSIONAL ETHICS AND HUMAN VALUES
SUB CODE: 14EC601

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

HUMAN VALUES: Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully, caring, Sharing, honesty, Courage, Valuing Time, Co-operation, Commitment, Empathy, Self Confidence, Character, Spirituality.

UNIT – II

ENGINEERING ETHICS: Senses of 'Engineering Ethics', Variety of model issues, Types of inquiry, Moral dilemmas, Moral Autonomy, Kohlberg's theory, Gilligan's theory, Consensus and Controversy, Professions and Professionalism, Professional Ideals and Virtues, Theories about right action, Self-interest, customs and Religion, Uses of Ethical Theories.

UNIT – III

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering as Experimentation, Engineers as responsible Experimenters, Codes of Ethics, A Balanced Outlook on Law. 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 , Intellectual Property Rights (IIPR) , Discrimination.

UNIT – IV

GLOBAL ISSUES: Multinational Corporations , Environmental Ethics, Computer Ethics, Weapons Development , Engineers as Managers , consulting Engineering, Engineers as Expert Witnesses and Advisors, Moral Leadership, Sample Code of Ethics like ASME, ASCE, IEEE, Institution of engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE), India, etc.

TEXT BOOKS:

1. R. Subramanian, Professional ethics, Oxford higher Education, 2013.
2. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw Hill, NewYork 1996.

REFERENCE BOOK:

1. Govindarajan. M, Natarajan. S, Senthilkumar. V.S, Engineering Ethics, PHI, 2004.

MICROPROCESSORS AND MICROCONTROLLERS
SUB CODE: 14EC602

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

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

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. An example of minimum mode system, addressing memory and ports in microcomputer system. 8086 interrupts and interrupt responses.

UNIT – III

DIGITAL INTERFACING: Programmable parallel ports, handshake IO, 8255 programmable peripheral interface. Interfacing microprocessor to keyboards.

ANALOG INTERFACING: DAC principle of operation and interfacing.

PROGRAMMABLE DEVICES: Introduction to Programmable peripheral devices 8254, 8259, 8251, DMA data transfer, 8237 DMA controller, RS232 communication standard and maximum mode of 8086 operation.

UNIT – IV

INTRODUCTION TO MICROCONTROLLERS: comparing microprocessors and microcontrollers, 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. Programming & interfacing 8051:- Addressing modes of 8051 microcontroller, Instruction set of 8051 microcontroller, simple programs using 8051 microcontroller. Interfacing a stepper motor, ADC.

TEXT BOOKS:

1. Duglus V. Hall, Microprocessor and Interfacing, Revised 2nd Edition, TMH, 2006.
2. Mohammed Ari Mazidi and JanciGillispie, The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, New Delhi.

REFERENCE BOOK:

1. Advanced Microprocessors and Peripherals AK Ray and KM Bhurchandi 2nd Edition, TMH.

DIGITAL SIGNAL PROCESSING
SUB CODE: 14EC603

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

INTRODUCTION: Signals, Systems and Signal Processing, classification of signals, the concept of frequency in Continuous - Time and Discrete – Time signals.

DISCRETE-TIME SIGNALS AND SYSTEMS: Discrete-Time Signals, Discrete-Time Systems, Analysis of Discrete-Time Linear Time-Invariant Systems, Discrete-Time Systems Described by Difference Equations, Recursive and Nonrecursive Discrete-Time Systems.

THE Z-TRANSFORM AND ITS APPLICATION TO THE ANALYSS OF LTI SYSTEMS: The Z Transform, Properties of the Z Transform, Rational Z Transforms, Inversion of the Z Transform, Analysis of Linear Time-Invariant Systems in the Z Domain, the One-sided Z Transform.

UNIT – II

THE DISCRETE FOURIER TRANSFORM: ITS PROPERTIES AND APPLICATIONS: Frequency Domain Sampling: The Discrete Fourier Transform, Properties of the DFT.

EFFICIENT COMPUTATION OF THE DFT: FAST FOURIER TRANSFORM ALGORITHMS: Efficient Computation of the DFT FFT Algorithms, Applications of FFT Algorithms.

UNIT – III

DESIGN OF DIGITAL FILTERS: General Considerations, Design of IIR Filters From Analog Filters, Frequency Transformations, Frequency Transformations in the Analog Domain, Frequency Transformations in the Digital Domain.

IMPLEMENTATION OF DISCRETE- TIME SYSTEMS: Structures for the Realization of Discrete-Time Systems, Structures for IIR Systems.

UNIT – IV

DESIGN OF DIGITAL FILTERS: Design of FIR Filters, Symmetric and Antisymmetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency-Sampling Method.

IMPLEMENTATION OF DISCRETE- TIME SYSTEMS: Structures for FIR Systems.

TEXT BOOK:

1. John G. Proakis, Dimitris G Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, 4th Edition, Pearson Education, 2007.

REFERENCE BOOKS:

1. Sanjit K Mitra, Digital Signal Processing: A Computer Based Approach, 3rdEdition, TMH, SIE, 2008.
2. Lonnie C Ludeman, Fundamentals of Digital Signal Processing, John Wiley & Sons, 2009.
3. Alan V Oppenheim and Ronald W Schafer, Discrete Time Signal Processing, Pearson Education, 2007.

ANTENNAS AND WAVE PROPAGATION
SUB CODE: 14EC604

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

RADIATION: Radiation Mechanism, Potential functions-heuristic approach, Maxwell's equation approach, Potential functions for sinusoidal oscillations, Alternating current element, Power radiated by current element, Application to short antennas, Assumed current distribution, Radiation from quarter wave Monopole / half wave dipole, Traveling wave antennas and the effect of the point of feed on standing wave antennas.

UNIT – II

ANTENNA FUNDAMENTALS: Isotropic, Directional, Omni-directional patterns, Principle patterns, Field regions, Radiation density, Radiation intensity, Directive gain, Power gain, Half power Beamwidth, Antenna polarization, Power loss factor, Radiation efficiency, Effective aperture of antenna, Relation between maximum effective aperture and directivity, Friss transmission equation.
ARRAY ANTENNAS: Two element array, Uniform linear array, Side lobe level and beam width of broadside array, Beam width of end fire array, Principle of multiplication of patterns, Effect of earth on vertical patterns, Binomial array, Basic principle of Dolph – Tschebyscheff array.

UNIT – III

Characteristics of typical antennas and Rhombic antennas, Folded Dipole, Loop antenna, Yagi Uda array, Helical antenna, Log periodic antenna, Pyramidal and conical Horn antenna, Corner reflector antenna, Parabolic reflector antennas - Paraboloid and parabolic cylinder, Cassegrain system of reflectors, Basic principles of slot antennas and micro strip antennas.

UNIT – IV

RADIO WAVE PROPAGATION: Ground wave Propagation, Earth constants, Space-wave Propagation, Effect of curvature of an Ideal Earth, Variations of Field strength with height in space-wave Propagation, Atmospheric effects in space-wave Propagation, Radio-Horizon, Duct Propagation, Extended-range Propagation resulting from Tropospheric Scattering, lonospheric Propagation, Gyro frequency, Refraction and reflection of Sky Waves by the Ionosphere, Critical Frequency, Skip Distance, Maximum Usable Frequency.

TEXT BOOKS:

1. Edward C Jordan and Keith G Balmain, Electromagnetic Waves and Radiating Systems, 2nd Edition, PHI, 2003.
2. Constantine A Balanis, Antenna Theory: Analysis and Design, Harper and Row Publishers, 2002.

REFERENCE BOOKS:

1. J. D. Kraus and Ronald J Marhefka, Antennas For all Applications, TMH, 2003.
2. G. S. N. Raju, Antennas and Wave Propagation, 1st Edition, Pearson Publication, Singapore.

OBJECT ORIENTED PROGRAMMING WITH JAVA
SUB CODE: 14EC605

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT-I

INTRODUCTION: Creation of Java, importance of Java to internet, byte code, Java buzzwords, OOP Principles, Encapsulation, Inheritance and Polymorphism, data types, variables, declaring variables, dynamic initialization, scope and life time of variables, arrays, operators, control statements, type conversion and casting, compiling and running of simple Java program.

UNIT-II

CLASSES AND OBJECTS: Concepts of classes and objects, class fundamentals Declaring objects, assigning object reference variables, introducing methods, constructors, usage of static with data and methods, usage of final with data, access control, this key word, garbage collection, overloading methods and constructors, parameter passing - call by value, recursion, nested classes and inner classes, exploring the String class.

UNIT-III

INHERITANCE: Basic concepts, member access rules, usage of super key word, forms of inheritance, method overriding, abstract classes, dynamic method dispatch, using final with inheritance, the Object class.

PACKAGES AND INTERFACES: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT-IV

EXCEPTION HANDLING AND MULTITHREADING: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes, Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups.

TEXT BOOKS:

1. The Complete Reference Java J2SE 7th Edition by Herbert Schildt, McGraw-Hill Companies.
2. Big Java 2nd Edition, Cay Horstmann, John Wiley and Sons.

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.

COMPUTER ORGANIZATION AND ARCHITECTURE
SUB CODE: 14EC606A

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

BASIC STRUCTURE OF COMPUTERS: Computer types, Functional Unit, Basic operational concepts, Bus structures, Performance, multiprocessors and multi computers.

MACHINE INSTRUCTIONS AND PROGRAMS : Numbers, Arithmetic operations and characters, Memory location and addresses , Memory operations, Instructions and instruction sequencing ,Addressing modes, Basic Input and Output operations, Stacks and Queues, Subroutines, Additional instructions ,Encoding of machine instructions.

UNIT - II

BASIC PROCESSING UNIT: Some fundamental concepts, Execution of a complete instruction, multiple bus organization, Hard wired control, Micro programmed control.

Arithmetic: Addition and subtraction of signed numbers, Design of fast adders, Multiplication of positive numbers, Signed operand multiplication, Fast multiplication, Integer division, Floating point numbers and operations.

UNIT - III

PIPELINING: Basic concepts, Data hazards, Instruction hazards, Influence of instruction sets, Data path and control considerations, Super scalar operation, Performance considerations.

THE MEMORY SYSTEM: Some basic concepts, Semiconductor RAM memories- Internal Organization of memory chips, Read only memories, Speed, size and cost, Cache memories, Performance considerations, Virtual memories.

UNIT - IV

INPUT/OUTPUT ORGANIZATION: Accessing I/O devices, Interrupts, Direct memory access, Buses Standard I/O interfaces: PCI, SCSI, USB.

TEXT BOOK:

1. Computer Organization – Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Fifth Edition, McGraw Hill.

REFERENCE BOOKS:

1. Computer Architecture and Organization-John P. Hayes, Third Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings, Sixth Edition, Pearson/PHI.
3. Computer Systems Architecture – M. Moris Mano, Third Edition, Pearson/PHI.

COMMUNICATION SYSTEMS
SUB CODE: 14EC606B

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

RADIO TRANSMITTERS: Frequency allocation for radio communication systems, Block diagrams and functions of radio transmitters for AM and FM systems. **RADIO RECEIVERS:** TRF and super heterodyne receivers, RF, Mixer and IF stages, Choice of IF, Image frequency, Alignment and tracking of radio receivers, AGC, Tone and volume controls, Receiver characteristics and their measurements, FM receivers, Communication receivers, Fading and diversity reception.

UNIT – II

TELECOMMUNICATION SWITCHING SYSTEMS: Evolution of Telecommunications, Simple telephone communication, Basics of switching system, Electronic space division switching: Stored Program Control, Centralized SPC, Distributed SPC, Two stage networks, Three stage networks, n stage networks, Time division switching: Basic time division space switching, Basic time division time switching, Combination switching, Three stage combination switching, n stage combination switching.

UNIT – III

TELEVISION: Vision characteristics and scanning systems, Composite video signal, Camera tubes: Principle of operation, Image Orthicon, Vidicon, Plumbicon, Block diagram of broadcast TV transmitter, Block diagram of broadcast TV receiver.

UNIT – IV

COLOR TELEVISION: Color fundamentals, Color TV cameras, Picture tubes, TV transmission and reception, NTSC, PAL & SECAM systems, Cable television, Digital TV, DTH.

TEXT BOOKS:

1. George Kennedy, Electronic Communication Systems, Mc Graw Hill, 4th Edition, 1999.
2. T Viswanathan, Telecommunication Switching Systems and Networks, PHI, 2004.
3. RR Gulati, Monochrome and Color Television, New Age Publishers, 1996.

REFERENCE BOOKS:

1. RR Gulati, Composite Satellite and Cable Television, New Age International, 2000.
2. William Schweber, Electronic Communication Systems: A Complete Course, 4th Edition, PHI, 2002.

BIOMEDICAL ELECTRONICS
SUB CODE: 14EC606C

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

INTRODUCTION: Introduction to Bio-Medical Engineering field, Components of Man-Instrument system, problems encountered in measuring a living system.

PHYSIOLOGICAL SYSTEMS OF THE BODY: Basic Features of cardiovascular system, Nervous system, muscular system, respiratory system.

RESTING POTENTIAL & ACTION POTENTIAL CONCEPTS: Resting potential concept, characteristics of resting potential, action potential concept, propagation of action potential.

BIO-ELECTRIC POTENTIALS: Definition for Bio-electric Potential, Typical Examples of Bio-Electric Potential with important features.

UNIT – II

BIO-MEDICAL ELECTRODES: Introduction to Bio-Medical Electrodes, Various types of Bio-Medical Electrodes: surface electrodes, micro electrodes, needle electrodes depth electrodes.

ELECTRO CARDIOGRAHPHY (ECG): Introduction to electro cardiography, ECG LEAD Concept, various types of ECG Lead configurations, typical ECG waveform details, ECG recording, Analysis of Recorded ECG waveform.

ELECTRO ENCEPHALOGRAPHY (EEG): Introduction to Electro Encephalography, EEG Recording EEG in diagnostics.

ELECTRO MYOGRAPHY: Introduction to Electro - Myography, EMG Recording, EMG Applications.

UNIT – III

CARDIOVASCULAR MEASUREMENTS: Introduction to various cardiovascular parameters: Blood Pressure Blood flow, cardiac output, Heart sounds. Blood Pressure Measurement techniques: Direct methods & In-direct Methods.

BLOOD FLOW MEASUREMENT TECHNIQUES: Electro Magnetic Blood flow meter, ultrasonic Blood flow meter, Thermal convection method. Cardiac output Measurement techniques: Fick's technique, Indicator dilution method, thermal dilution method, Impedance change method. Phono cardiography: Heart sounds Recording.

UNIT – IV

THERAPEUTIC INSTRUMENTS: Cardiac Pacemakers, Types of pacemakers: External pace makers, Internal Pacemakers, Pacing modes, lead wires & Electrodes for internal pacemakers, power sources for implantable cardiac pacemakers, hem dialysis. Cardiac defibrillators, defibrillator electrodes, Introduction to diathermy. Various diathermy apparatus: surgical, shortwave, microwave.

INSTRUMENTS FOR CLINICAL LABORATORY: Introduction to Bio-Chemical electrodes, Types of Bio-Chemical electrodes for measurement of various Blood gas parameters such as Blood P^{H}, $P^{O2}P^{CO2}$ Blood gas analyzer, Blood cell counters.

MODERN TECHNOLOGIES IN BIO-MEDICAL FIELD: Use of X-Rays in medicine, CT scan, ultrasound applications in medicine, MRI scan.

TEXT BOOKS:

1. Khandpur, Hand Book of Bio-Medical Instrumentation, 2nd Edition, TMH.
2. Cromwell Weibell, Bio-Medical Instrumentation and Measurements, Pfeiffer, PHI (or) LPE Pearson 2nd Edition.

REFERENCE BOOK:

1. Webster, Medical Instrumentation Application &Design, John Wiley & Sons.

ROBOTICS
SUB CODE: 14EC606D

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

ROBOTIC MANIPULATION: Automation and Robots; Robot Classification – Drive Technologies, Work-Envelope Geometries, Motion Control Methods, Applications; Robot Specifications – No. of Axes, Capacity and Speed, Reach and Stroke, Tool Orientation, Repeatability, Precision, Accuracy, Operating Environment, An Example; Rhino X-3.

UNIT – II

DIRECT KINEMATICS: The Arm Equation Homogenous Co-ordinates – Frames, Translations and Rotations, Composite Homogenous Transformations; Screw Transformations; Link Co-ordinates; The Arm Equation; A Five-Axis Articulated Robot; A Four-Axis Scara Robot; A Six-Axis Articulated Robot; Problems.

INVERSE KINEMATICS: Solving the Arm Equation: The Inverse Kinematics Problem; General Properties of Solutions; Tool Configuration; Inverse Kinematics of a Five-Axis Articulated Robot, Four-Axis Scara Robot, Six-Axis Articulated Robot and Three-Axis Planer Articulated Robot; A Robotic Work Cell; Problems.

UNIT – III

WORK SPACE ANALYSIS AND TRAJECTORY PLANNING : Work Space Analysis; Work Envelope of a Five-Axis Articulated Robot; Work Envelope of a Four Axis Scrara Robot; Work Space Fixtures; The Pick and Place Operation; Continuous Path Motion; Interpolated Motion; Straight Line Motion; Problems.

UNIT – IV

ROBOT CONTROL : The Control Problems; State Equations; Constant Solutions; Linear Feedback Systems; Single-Axis PID Control; PD-Gravity Control; Computed –Torque Control; Variable-structure Control; Impedance Control; Problems.

TEXT BOOK:

1. Fundamental of Robotics (Analysis & Control) by Robert J. Schilling, Published by PHI, Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. Introduction to Robotics (Mechanics & Control) by John J. Craig, Published by Addition Wesley (Intl. Student Edition).
2. Foundations of Robotics Analysis and Control - Tsuneo Yashikawa MIT Press 1990, Indian Reprint 1998.
3. Robots and Control - R. K. Mittal and I. J. Nagrath - Tata McGraw Hill 2003.

SOFT SKILLS Lab
LAB CODE: 14ELL601

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

Course Schedule:

1. **BODY LANGUAGE**
   a. Facial Expressions.
   b. Kinesics.
   c. Oculesics.
   d. Haptics.
   e. Proxemics.
   f. Para Linguistics.
2. **LIFE SKILLS**
   b. Positive Attitude
   c. Social Behaviour & Social Norms.
   d. Ethics, Values and Positive Work Ethics.
   e. Time Management.
   f. Goal Setting, Vision, Mission.
3. **EMOTIONAL INTELLIGENCE**
   a. Self-Awareness through Johari Window and SWOT analysis.
   b. Self-Control.
   c. Self-Motivation.
   d. Empathy.
   e. Social Skills.
   f. Self Esteem.
   g. Managing stress.
   h. Assertiveness.
4. **PROBLEM SOLVING SKILLS**
   a. Critical Thinking and Brain Storming.
   b. Lateral Thinking and Six Thinking Hats.
   c. Creative Thinking.
   d. Conflict Management.
5. **EMPLOYABILITY SKILLS**
   a. Group Discussion.
   b. Team Building and Leadership Qualities.
   c. Interview Skills.

RFFERENCE BOOKS:

1. The Definitive Book of Body Language, Allan & Barbara Pease.
2. You Can Win, Shiv Khera.
3. Lateral Thinking, Edward De Bono.
4. How to Prepare For Group Discussions and Interview, Hari Mohan Prasad, Rajnish Mohan, 2nd Edition, TMH.
5. Emotional Intelligence, Daniel Goleman.
6. The 7 Habits Of Highly Effective People, Stephen R. Covey
7. Working in Teams, Sandy Pokras.

MICROPROCESSORS AND MICROCONTROLLERS LAB
LAB CODE: 14ECL602

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF LAB EXPERIMENTS

Experiments Based on ALP (8086)

1. Programs on Data Transfer Instructions.
2. Programs on Arithmetic and Logical Instructions.
3. Programs on Branch Instructions.
4. Programs on Subroutines.
5. Sorting of an Array.
6. Programs on Interrupts (Software and Hardware).
7. 8086 Programs using DOS and BIOS Interrupts.

Experiments Based on Interfacing & Microcontroller (8051)

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

NOTE: A minimum of 10(Ten) experiments, choosing 5 (Five) from each part, have to be Performed and recorded by the candidate to attain eligibility for Semester End Examination.

OBJECT ORIENTED PROGRAMMING USING JAVA LAB
LAB CODE: 14ECL603

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF LAB PROGRAMS

Write JAVA programs to illustrate the concept of the following:

1. Arrays.
2. Structures.
3. Pointers.
4. Objects and Classes.
5. Console I/O operations.
6. Scope resolution and memory management operators.
7. Inheritance.
8. Polymorphism.
9. Virtual Functions.
10. Friend Functions.
11. Operator overloading.
12. Function overloading.
13. Constructors and Destructors.
14. This pointer.
15. File I/O operations.

NOTE: A minimum of ten programs are to be executed and recorded to attain eligibility for Semester End Examination.

INDUSTRIAL MANAGEMENT & ENTREPRENEURSHIP DEVELOPMENT
SUB CODE: 14EC701

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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; Merits and Demerits of above types.

Marketing Management: Functions of Marketing, Concepts of Selling and Marketing, Marketing mix (4 Ps); Advertising and sales promotion; Product life cycle.

UNIT – II

Production Management: Types of production systems, Productivity Vs Production, Production planning and control.

Materials Management: Inventory Control, Basic EOQ model, ABC analysis.

Quality Control: Control Charts: $\bar{x}$ chart, R chart, P chart, C chart, Acceptance sampling.

UNIT – III

Financial Management: Functions of finance, Types of Capital-Fixed and Working Capital, Break Even Analysis.

Depreciation- Straight line method of depreciation, declining balance method and the Sum of Years digits method of Depreciation.

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

UNIT – IV

Entrepreneurship Development: Introduction, Entrepreneurial characteristics, Functions of an Entrepreneur; Factors affecting entrepreneurship; Role of communication in entrepreneurship; Entrepreneurial development-Objectives, Need of Training for enterprises; Finance for the enterprises; 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. Management Science, A. R. Aryasri.

REFERENCE BOOKS:

1. Operations Management, Joseph G Monks.
2. Marketing Management, Philip Kotler.
3. The Essence of Small Business, Barrow colin.
4. Small Industry Ram K Vepa.

VLSI DESIGN
SUB CODE: 14EC702

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT - I

AN INTRODUCTION TO MOS TECHNOLOGY: Introduction to IC technology, Basic MOS transistors, NMOS fabrication, CMOS fabrication and BICMOS technology. Basic Electrical Properties of MOS and BICMOS Circuits: Ids versus V_{ds} relationships, threshold voltage V_t, Transconductance g_m, Figure of merit ω_o, Pass transistor, NMOS inverter, Pull-up to pull- down ratio, CMOS inverter, BICMOS inverters, Latch up in CMOS circuits.

UNIT - II

MOS AND BICMOS CIRCUIT DESIGN PROCESSES: MOS layers, Stick diagrams, Design rules and layout, 2μm rules.

Basic Circuit Concepts: Sheet resistance Rs, Standard unit of capacitance $\square C_g$, The Delay unit τ, Inverter delays, Propagation delays, Wiring capacitances.

Scaling of MOS Circuits: Scaling models and Scaling factors, scaling factors for device parameters.

UNIT - III

SUBSYSTEM DESIGN AND LAYOUT: Architectural issues, Switch logic, Gate Logic, examples of Structured Design (combinational logic and sequential logic). Design of an ALU subsystem.

UNIT - IV

VLSI design flow, Introduction to ASICs, Full Custom ASICs, standard cell based ASICs, Gate array based ASICs, Programmable logic devices, PLAs, PALs, CPLDs and FPGAs.

Verilog HDL: Emergence and Importance of HDLs, Basic Concepts, Modules and Ports, Simulation and Synthesis, Switch Level Modelling, Gate-Level Modelling, Data Flow Modelling, Behavioural Modelling, Tasks and Functions.

TEXT BOOKS:

1. Douglas A. Pucknell and Kamran Eshranghian, Basic VLSI Design, Third edition, PHI, 2002.
2. Michael John Sebastian Smith, Application Specific Integrated Circuits, Addison Wesley, 2003.
3. Samir Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, Second Edition, Prentice Hall PTR, 2003.

REFERENCE BOOKS:

1. Neil H E Weste and Kamran Eshranghian, Principles of CMOS VLSI Design, A system perspective, 2nd Edition, Pearson Education, 2002.
2. Stephen Brown and Z VonkoVranesic, Fundamentals of Digital Logic with Verilog HDL Design, TMH, 2002.
3. John F Wakerly, Digital Design Principles & Practices, 3rd Edition, Pearson Education, 2002.

MICROWAVE THEOREY AND TECHNIQUES
SUB CODE: 14EC703

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

INTRODUCTION TO MICROWAVE ENGINEERING: Microwave Frequency Band Designations, IEEE Frequency Band Designations, Advantages of Microwaves, Applications of Microwaves.

CAVITY RESONATORS: Rectangular Cavity Resonators, Circular Cavity Resonators, Applications of Cavity Resonators, Quality Factor (Q) and Coupling Coefficient.

WAVEGUIDE COMPONENTS: Coupling mechanisms, Waveguide Discontinuities, Waveguide Attenuators, Microwave TEE Junctions - E-plane Tee, H-plane Tee, Magic Tee, Applications of magic Tee, Hybrid Ring and its Applications, Directional Couplers- Two-Hole Directional Couplers, Bethe-hole Directional Coupler, Applications of Directional Couplers, Faraday Rotation Based Isolator and Circulator, Waveguide Bends and Joints.

UNIT – II

SCATTERING MATRIX FOR WAVEGUIDE COMPONENTS: Significance of Scattering(S) parameters, Formulation of Scattering matrix, S-Parameter Evaluation, S-Parameter for n Ports, Properties of a Scattering matrix, Scattering matrix Calculations for E-plane Tee, H-plane Tee, Magic Tee, Directional Coupler, Circulator, Isolator and an ideal Transmission line of length L.

UNIT – III

MICROWAVE TUBES: Limitations of Conventional tubes at Microwave frequencies, Re-Entrant Cavities. Linear Beam (O Type) tubes- Two cavity Klystron amplifier, Structure of Two cavity Klystron, Velocity modulation process and Applegate Diagram, bunching process and Small Signal Theory, Expression for Output Power and Efficiency. Multicavity Klystron, Reflex Klystron- Structure of Reflex Klystron, Applegate Diagram and Principle of Working, Mathematical Theory of Bunching, Power Output and Efficiency, Electronic Admittance, Operating Modes and Output Characteristics, Electronic and Mechanical Tuning. Travelling Wave Tube- Types and Characteristics of Slow-Wave Structures, Structure of TWT and Amplification Process. M-Type Tubes- Eight cavity Cylindrical Magnetron, Modes of Resonance and π Mode operation, Hull Cut-off Voltage Equation, Separation of π mode, Sustained Oscillations in Magnetrons.

UNIT – IV

MICROWAVE SOLID STATE DEVICES: Transferred Electron Devices-Gunn Diode-Operation and Characteristics of Gunn Diode, Domain Formation, RWH theory of Gunn Diode, Equivalent Circuit of Gunn Diode, Basic Modes of operations, Applications of Gunn Diode. Tunnel diode, Avalanche Transit Time Devices- IMPATT diode, TRAPATT diode, PIN diode, Schottky Diode, Varactor diode, Crystal Diode.

MICROWAVE MEASUREMENTS: Description of Microwave Bench, Microwave power measurement, Microwave Attenuation measurement, Microwave Frequency measurement, Microwave VSWR measurement, Measurement of Q of a Cavity Resonator, Impedance measurement.

TEXT BOOK:

1. Microwave and Radar Engineering by Gottapu Sasi Bhushana Rao, Pearson Publications, 2014.

REFERENCE BOOKS:

1. Samuel Y Liao, Microwave Devices and Circuits, 3rd Edition, Pearson Education, 2003.
2. Microwave and Radar Engineering by M. Kulkarni, Umesh Publications, New Delhi, 2009.

DIGITAL IMAGE PROCESSING
SUB CODE: 14EC704

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT - I

INTRODUCTION: What Is Digital Image Processing? The Origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System.

DIGITAL IMAGE FUNDAMENTALS: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, An introduction to the mathematical tools used in Digital Image Processing.

UNIT II

INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING: Background. Some Basic Intensity Transformation functions, Histogram Processing, Fundamentals of Spatial Filters, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

FILTERING IN THE FREQUENCY DOMAIN: Background, Extension to Functions of two variables, Some properties of 2D Discrete Fourier Transform, The basics of filtering in the Frequency Domain, Image smoothing using frequency domain filters, Image sharpening using frequency domain filters, Selective filtering.

UNIT III

IMAGE RESTORATION: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter.

COLOR IMAGE PROCESSING: Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Image Segmentation based on color, Noise in Color Images, Color Image Compression.

UNIT - IV

IMAGE COMPRESSION: Fundamentals, Some basic compression Methods, Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run length coding, Symbol based coding, Bit plane coding, Block transform coding, Predictive coding.

MORPHOLOGICAL IMAGE PROCESSING: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit or Miss Transformation, Some basic morphological algorithms, Gray scale morphology.

TEXT BOOK:

1. R. C. Gonzalez, R. E. Woods, Digital Image Processing 3rd Edition, Pearson Education Publishers, 2009.

REFERENCE BOOKS:

1. A K Jain, Digital Image Processing, PHI, 1989.
2. B Chanda and D Dutta Majumder, Digital Image Processing and Analysis, PHI, 2001.
3. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing Analysis and Machine Vision, Thomson learning, Second Edition, 2001.

COMPUTER NETWORKS
SUB CODE: 14EC705A

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

INTRODUCTION: Uses of Computer networks, Network Hardware, Network Software, Reference Models (OSI and TCP/IP only).

PHYSICAL LAYER: Introduction to Guided Transmission Media, Wireless Transmission.

UNIT – II

DATA LINK LAYER: Data Link Layer design issues, Error detection and correction, Elementary Data link Protocols, Sliding window protocols.

MEDIUM ACCESS CONTROL SUBLAYER: The channel Allocation problem, Multiple Access Protocols, Ethernet, Wireless LANs, Broadband wireless, Bluetooth, Data Link Layer Switching.

UNIT – III

NETWORK LAYER: Network layer Design Issues, Routing Algorithms – (The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Routing for Mobile Hosts.) Congestion Control Algorithms, Quality of Service - (Requirements, Techniques for Achieving Good Quality of Service), Internetworking, The Network layer in the internet (The IP Protocol, IP Address, Internet Control Protocols, OSPF, BGP).

UNIT – IV

TRANSPORT LAYER: Elements of Transport Protocols, TCP, UDP, RTP. APPLICATION LAYER: DNS, Electronic Mail, The World Wide Web (Architectural Overview only) Multimedia.

TEXT BOOKS:

1. A.S Tanenbaum, Computer Networks, 4th Edition, PHI, 2003.
2. Behrouz A. Foruzan, Data communication and Networking, 4th Edition,TMH, 2004.

FUZZY LOGIC
SUB CODE: 14EC705B

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

FUZZY SETS AND CRISP SETS: Introduction to crisp sets and fuzzy sets, Representation of fuzzy sets, Operations on fuzzy sets: Types of operations, fuzzy complements, fuzzy intersections, fuzzy unions, Combinations of operations, Fuzzy Arithmetic: Fuzzy numbers, Fuzzy equations, Crisp Vs Fuzzy relations.

UNIT – II

FUZZY LOGIC: Classical Logic, Multi valued logics, Fuzzy propositions, Fuzzy quantifiers, Linguistic Hedges, Inference from conditional fuzzy propositions, Inference from conditional and qualified propositions, Inference from quantified propositions.

UNCERTAINTY BASED ON INFORMATION: Information and uncertainty, Fuzziness of fuzzy sets, Principles of uncertainty.

UNIT – III

CONSTRUCTING FUZZY SETS AND OPERATIONS ON FUZZY sets: Methods of construction, Direct Methods with one and multiple experts, Indirect methods with one and multiple experts, Constructions sample data.

APPROXIMATE REASONING: Fuzzy Expert Systems, Fuzzy implications and selection, The role of fuzzy relation equations.

UNIT – IV

FUZZY SYSTEMS AND APPLICATIONS: Introduction to fuzzy controllers with examples, Fuzzy systems and neural networks, Fuzzy neural networks, Fuzzy automata, Fuzzy Dynamic systems, Fuzzy Pattern Recognitions, Fuzzy Image Processing.

TEXT BOOK:

1. George J Klir, Fuzzy Sets and Fuzzy Logic: Theory and Applications, 2/e, Pearson Education.

REFERENCE BOOKS:

1. John Yen & Reza Langari, Fuzzy Logic: Intelligence, Control, and Information, Pearson Education.
2. I.S.R. Jang, C.T. Sun, E. Mizutani, Neuro-Fuzzy and Soft Computing, Prentice-Hall, 97.
3. S. Rajsekaran& G.A. VijayalakshmiPai, Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, Prentice Hall of India.

GLOBAL POSITIONING SYSTEM AND APPLICATIONS
SUB CODE: 14EC705C

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT I

OVERVIEW OF GPS: Basic concept, system architecture, space segment, user segment, GPS aided Geo-augmented navigation (GAGAN) architecture. GPS Signals Signal structure, anti spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

UNIT II

GPS COORDINATE FRAMES, TIME REFERENCES: Geodetic and Geo centric coordinate systems, ECEF coordinates, world geodetic 1984 (WGS 84), GPS time.

UNIT III

GPS ORBITS AND SATELLITE POSITION DETERMINATION: GPS orbital parameters, description of receiver independent exchange format (RINEX) – Observation data and navigation message data parameters, GPS position determination.

UNIT IV

GPS ERRORS: GPS error sources – clock error, ionospheric error, tropospheric error, multipath, ionospheric error estimation using dual frequency GPS receiver.

TEXTBOOK:

1. G S RAO, Global Navigation Satellite Systems, McGraw-Hill publications, New Delhi, 2010.

REFERENCE BOOKS:

1. B. Hoffman – Wellenhof, H. Liehtenegger and J. Collins, GPS – Theory and Practice, Springer – Wien, New York (2001).
2. James Ba – Yen Tsui, Fundamentals of GPS receivers – A software approach, John Wiley & Sons (2001).

SATELLITE COMMUNICATIONS
SUB CODE: 14EC705D

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Introduction: A brief history of Satellite communications, Orbital Mechanics and Launchers: Orbital mechanics, Look angle determination, Orbital perturbations, Orbit determination, Launch and Launch vehicles, Orbital effects in Communication System performance.

UNIT – II

Satellites: Satellite sub systems, Attitude and Orbit Control system (AOCS), Telemetry, Tracking, Command & Monitoring, Power Systems, Communication subsystems, satellite antennas.

Satellite Link Design: Introduction, Basic transmission theory, System noise temperature and G/T ratio. Design of Downlinks, Satellite systems using small earth stations, Uplink Design.

Design for specified C/N: Combining C/N and C/I values in satellite links.

UNIT – III

Multiple Access: Introduction, FDMA, TDMA, Onboard Processing, Demand Access Multiple Access (DAMA), Random Access, CDMA.

VSAT systems: Introduction, Overview of VSAT systems, Network Architectures, Access control Protocols, Basic techniques, VSAT Earth Station Engineering.

UNIT – IV

Satellite Navigation and Global positioning System: Introduction, Radio and satellite Navigation, GPS position location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, Timing Accuracy, GPS Receiver Operation, GPS C/A code Accuracy, Differential GPS.

TEXT BOOK:

1. Satellite Communications, Timothy Pratt, Charles Bostian, Jeremy Allnutt, 2nd Edition John Wiley India, 2006.

REFERENCE BOOKS:

1. Satellite Communications, Dennis Roddy, McGraw-Hill International Edition, Third edition, 2001.
2. Advanced Electronic Communication Systems, W Tomasi, 4th Edition, Pearson Education, 2002.

LIST OF OPEN ELECTIVES

DEPARTMENT	SUBJECT NAME	SUBJECT CODE
Chemical Engineering.	Industrial Pollution & Control	ChE 01
	Energy Engineering	ChE 02
Civil Engineering.	Air Pollution & Control	CE 01
	Remote Sensing & GIS	CE 02
Computer Science & Engineering.	Database Management Systems	CS 01
	Java Programming	CS 02
Electrical & Electronics Engineering.	Optimization Techniques	EE 01
	Non-Conventional Energy Sources	EE 02
Electronics & Communication Engineering.	Consumer Electronics	EC 01
	Embedded Systems	EC 02
Electronics & Instrumentation Engineering.	Virtual Instrumentation Using LABVIEW	EI 01
	Sensors & Transducers	EI 02
Information Technology.	Mobile Application Development	IT 01
	Web Technologies	IT 02
Mechanical Engineering.	Automobile Engineering	ME 01
	Refrigeration & Air Conditioning	ME 02
BOSCH REXROTH Centre	Automation Technology	BR 01

OPEN ELECTIVE
INDUSTRIAL POLLUTION & CONTROL
14OE706/ChE 01

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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
14OE706/ChE 02

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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
14OE706/CE 01

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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 phenomena on Air Quality-wind rose diagrams.

UNIT – III

Lapse Rates, Pressure Systems, Winds and 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.

TEXT BOOKS:

1. Air pollution By M.N.Rao and H.V.N.Rao – Tata Mc.Graw Hill Company.
2. Air pollution by Wark and Warner. Harper & Row, New York.

REFERENCE BOOK:

1. An introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications.

OPEN ELECTIVE
REMOTE SENSING AND GIS
14OE706/CE 02

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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. W, Remote sensing 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 A Burragh 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, B. S. Publications.
3. GIS by Kang - tsung chang, 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
14OE706/CS 01

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

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

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

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

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, Ramez Elmasri 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
14OE706/CS 02

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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.

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

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

UNIT – II

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 multiple threads, 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

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

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. Daniel Liang, Pearson Publication.

OPEN ELECTIVE
OPTIMIZATION TECHNIQUES
14OE706/EE 01

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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
14OE706/EE 02

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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, Mc Graw-Hill.
2. Non-Conventional Energy Sources by G. D. Rai, Khanna Pub.

OPEN ELECTIVE
CONSUMER ELECTRONICS
14OE706/EC 01

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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 Ronadl K. Jurgen, (Editor) by McGraw Hill Professional Publishing, 1997. **ISBN-10:** 0070341435.

OPEN ELECTIVE
EMBEDDED SYSTEMS
SUB CODE: 14OEC706/EC 02

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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, 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, behavioral 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 Wiley & sons 2002.
2. KVKK Prasad, Embedded and real time systems, Dreemtech Press, 2005.

REFERENCE BOOKS:

1. Raj Kamal, Embedded system architecture, programming and design, TMHedition.
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
14OE706/EI 01

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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
14OE706/EI 02

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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. Patranabis D, Sensors and transducers, second edition, PHI, New Delhi 2003.
2. Ernest O Doeblin, Measurement Systems Application and Design, TMH.

OPEN ELECTIVE
WEB PROGRAMMING
14OE706/IT01

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Introduction to XHTML, Cascading Style Sheets (CSS), JavaScript: Introduction to Scripting, Control Statements, Part 1, Control Statements, Part 2, Functions, Arrays, Objects.

UNIT - II

Dynamic HTML: Object Model and Collections, Dynamic HTML: Event Model, XML, RSS (Really Simple Syndication).

UNIT – III

Building Ajax-Enabled Web Applications, Web Servers (IIS and Apache).

UNIT - IV

Servlets and Java Server Pages.

TEXT BOOK:

1. Harvey M. Deitel and Paul J. Deitel, Internet & World Wide Web How to Program, 4/e, Pearson Education.

REFERENCE BOOKS:

1. Jason Cranford Teague, Visual Quick Start Guide CSS, DHTML &AJAX, 4e, Pearson Education.
2. Tom NerinoDoli smith, JavaScript & AJAX for the web, Pearson Education 2007.
3. Joshua Elchorn, Understanding AJAX, Prentice Hall 2006.
4. Marty Hall, Larry Brown, Core Servlets and JavaServer Pages™: Volume 1: Core Technologies, 2nd Edition, Prentice Hall.

OPEN ELECTIVE
MOBILE APPLICATION DEVELOPMENT
14OE706/IT 02

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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.

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.

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

UNIT – III

Introduction: 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 & Email: Sending SMS, Sending e-mails.

Working with Location: Obtaining the location of mobile using GPS and A-GPS, Displaying the Location on Maps.

Services and Broadcast Receivers: Working with Services and broadcast receivers.

Publishing Apps: Preparing for publishing and deploying the APK file.

TEXT BOOKS:

1. The Complete Reference Java J2SE, 7th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi.
2. Beginning Android application development, Wei-Meng Lee, Wiley Publishing Inc.

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
AUTOMOBILE ENGINEERING
14OE706/ME01

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT I

INTRODUCTION: Classification of vehicles – applications, options of prime movers, transmission and arrangements.

ENGINE: Engine Classifications - number of strokes, cylinders, types of combustion chambers for petrol and diesel engines, valves, valve arrangements and operating Mechanisms, Piston - design basis, types, piston rings, firing order; Crankshafts, Flywheel.

ASSORTED EQUIPMENT: Fuel supply pumps, Mechanical and Electrical type Diaphragm pumps, Air and Fuel Filters, super chargers, Mufflers.

UNIT II

COOLING SYSTEMS: Need for cooling system, Air and water cooling.

LUBRICATING SYSTEMS: Various lubricating systems for I.C. Engines.

ELECTRICAL SYSTEM: Ignition system, Spark plugs, Distributor, Electronic Ignition, Alternator, cutout, Current and voltage regulators, charging circuit, starting motors, lighting, instruments and accessories.

UNIT III

CHASSIS & TRANSMISSION SYSTEMS: Introduction to Chassis & Transmission, Clutches – Single-plate and Multi-plate clutches, Centrifugal clutches, wet and dry type, actuating mechanisms.

TRANSMISSION: Gear Box - Theory, Four speed and Five Speed Sliding Mesh, Constant mesh & synchromesh type, selector mechanism, automatic transmission, overdrive, propeller shaft, differential - principle of working.

UNIT IV

SUSPENSION SYSTEMS: Need for suspension systems, springs, shock absorbers, axles – front and rear, different methods of floating rear axle, front axle and wheel alignment.

VEHICLE CONTROL: steering mechanisms and power steering, types of brakes and brake actuation mechanisms (air and hydraulic).

TEXT BOOKS:

1. Automobile Engineering - G.B.S.Narang.
2. Automobile Engineering - R.B.Gupta.
3. Automobile Engineering - Vol I & II - Kirpal Singh.

REFERENCE BOOKS:

1. Automotive Mechanics - Joseph Heitner.
2. Automobile Engineering - S.Srinivasan.

OPEN ELECTIVE
REFRIGERATION AND AIR CONDITIONING
14OE706/ME02

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT I

INTRODUCTION TO REFRIGERATION: Necessity and applications, unit of refrigeration and C.O.P, mechanical refrigeration, types of ideal cycle of refrigeration, Refrigerants- desirable properties, commonly used refrigerants, nomenclature.

AIR REFRIGERATION: Bell Coleman cycle and Brayton cycle, Open and Dense air systems, Actual refrigeration system, refrigeration needs of aircrafts, adoption of air refrigeration, Justification, types of systems.

UNIT II

VAPOUR COMPRESSION REFRIGERATION: Working principle, essential components of plant, simple vapor compression refrigeration cycle, Multi pressure systems – multistage compression, multi evaporator system, Cascade system, use of p – h charts.

SYSTEM COMPONENTS: Compressors- general classification, comparison, advantages and disadvantages, Condensers - classification, working, Evaporators - classification, working, Expansion devices - types, working.

UNIT III

VAPOUR ABSORPTION SYSTEM: Calculation of max COP, description and working of NH_3 - water system, Li - Br, H_2O system, principle of operation of three fluid absorption system and salient features.

STEAM JET REFRIGERATION: Principle of working, application, merits and demerits.

NON-CONVENTIONAL REFRIGERATION METHODS: Principle and operation of thermoelectric refrigerator and Vortex tube or Hirsch tube.

UNIT IV

INTRODUCTION TO AIR CONDITIONING: Psychrometric properties and processes, sensible and latent heat loads, need for ventilation, infiltration, concepts of RSHF, ASHF, ESHF & ADP, concept of human comfort and effective temperature, comfort air conditioning, industrial air conditioning requirements, air conditioning load calculations.

AIR CONDITIONING SYSTEMS: Classification of equipment, cooling, heating, humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers, heat pump, heat sources, different heat pump circuits, application.

TEXT BOOKS:

1. Refrigeration and air conditioning - C.P.Arora, TMH.
2. Refrigeration and Air conditioning - Manohar Prasad, New Age India, New Delhi.
3. A course in refrigeration and air conditioning - S.C.Arora & Domkundwar, Dhanpat Rai& sons, New Delhi.

REFERENCE BOOKS:

1. Principles of Refrigeration - Dossat.
2. Refrigeration and air conditioning - Stoecker.

NOTE: Refrigeration and Air conditioning Data book by Manohar Prasad is allowed in the exam.

OPEN ELECTIVE
AUTOMATION TECHNOLOGY
14OE706/BR 01

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 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.

BUSINESS COMMUNICATION and PRESENTATION SKILLS Lab
LAB CODE: 14ECL701/14ELL701

Lectures: 0	Tutorial: 0	Practical: 2	Self Study: 0
Continuous Internal Assessment: 20		Semester End Examination (3 Hours): 30	

UNIT-I

Identity Management Communication: – Face to Face Impression Management & Mediated Communication (Self Introduction & Self Promoting– Over Stating and Under Stating – Strategies to Overcome Communicative Inhibitions – Creating Positive Self-image through words - Appearance- Verbal and Non Verbal Manners) – Giving Polite Yet Assertive Responses – Responsive strategies to handle criticism - Accepting Failure and Declaring Success.

UNIT-II

Business Presentations*:*– Oral and Power Point Presentations; Preparing Successful Presentations; Assessing Audience, Making Effective Use of Visual Aids, Delivering Presentation, Using Prompts, Handling With Questions and Interruptions, Mock Presentations.

UNIT-III

Oratory Skills: –Advanced Group Discussion skills, Extempore, Mock Parliament and Mock Press.

UNIT-IV

Interview Management: – Resume Preparation, Types of Interviews, Preparing For Interviews, Facing Interviews, Handling Tough & Tricky Questions, Reviewing Performance, Participating In Mock Interviews.

REFERENCE BOOKS:

1. Personality Development and Soft Skills, Barun K. Mitra, Oxford University Press, Delhi:2007
2. Technical Communication Principles and Practices, Meenakshi Raman, Sangeeta Sharma: OUP: 2011.

VERILOG HDL LAB
LAB CODE: 14ECL702

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF PROGRAMS

1. Logic Gates.
2. Multiplexers/ De-Multiplexers.
3. Encoders/ Decoders.
4. Comparators.
5. Adders/ Subtractors.
6. Multipliers.
7. Parity Generators.
8. Design of ALU.
9. Latches.
10. Flip-Flops.
11. Synchronous Counters.
12. Asynchronous Counters.
13. Shift Registers.
14. Memories.
15. CMOS Circuits.

NOTE: A minimum of 10 (Ten) programs are to be executed and recorded to attain eligibility for Semester End Examination.

SIGNAL AND DIGITAL IMAGE PROCESSING
LAB CODE: 14ECL703

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF PROGRAMS

1. Amplitude Modulation.
2. Frequency Modulation.
3. Histogram and histogram equalization of an image.
4. Kernel processing on images leading to image enhancement.
5. Display of 2D filters frequency responses and processing the images using these filters.
6. Implementation of arithmetic coding for images.
7. Basic JPEG algorithm implementation.
8. Simple image watermarking algorithms using LSB substitution.
9. Simple content based image retrieval using various distance metrics.
10. Color images manipulations, reading and writing of color images.
11. Special effects implementation on grey and color images.
12. Color image enhancements.
13. Color image histogram manipulation.
14. LOG Masks implementation for gray and color images.
15. Simple video reading and writing .avi formats and manipulation of video frames.

NOTE: A minimum of 10 (Ten) programs are to be executed and recorded to attain eligibility for Semester End Examination.

RADAR ENGINEERING
SUB CODE: 14EC801

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Introduction to RADAR, The simple form of the Radar equation, Radar Block Diagram and operation, Applications of RADAR, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Signal to Noise Ratio, Integration of Radar pulses, Radar Cross Section of Targets, Cross Section Fluctuations, Transmitter Power, Pulse Repetition Frequency And Range Ambiguities, Antenna Parameters, System Losses ,Propagation Effects.

UNIT – II

CW and Frequency Modulated RADAR: The Doppler Effect, CW Radar, Frequency Modulated CW Radar, Multiple Frequency CW Radar.

MTI and Pulse Doppler radar: Introduction, Block Diagrams of MTI Radar Delay line cancellers, Multiple or Staggered Pulse Repetition Frequencies, Range Gated Doppler Filters.

UNIT – III

TRACKING RADAR: Tracking with Radar, Sequential lobing, conical scan, Monopulse Tracking RADARS (amplitude comparison and phase comparison).

RECEIVERS, DISPLAYS, AND DUPLEXERS: The RADAR Receiver, Noise Figure, Mixers, Low Noise front Ends, Displays, Duplexers and Receiver Protectors, Radomes.

UNIT – IV

Synthetic Aperture Radar, HF Over-the-Horizon Radar, Air-Surveillance Radar, Height Finder and 3D Radars, Bistatic Radar.

Electronic Warfare: Electronic counter measures and Electronic counter-counter measures, Introduction, Electronic counter measures, RADAR jamming, Electronic counter-counter measures, Electronic Support, Stealth applications.

TEXT BOOKS:

1. Introduction to Radar Systems, Merrill I Skolnik, 2nd Edition, TMH, 2007.
2. Fundamentals of RADAR , sonar and Navigation Engineering, KK Sharma, SK Kataria&Sons, Fourth Edition,2014.

FIBER OPTIC COMMUNICATIONS
SUB CODE: 14EC802

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

INTRODUCTION: Historical development, The general system, Advantages of Optical Fiber communications, **OPTICAL FIBER WAVEGUIDES:** Introduction, **RAY THEORY TRANSMISSION**: Total internal reflection, Acceptance angle, Numerical Aperture, Skew rays. **CYLINDRICAL FIBER:** Modes, Mode coupling, Step index fibers, Graded index fibers, Fiber materials.

UNIT – II

TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS: Introduction, Attenuation, Material absorption losses in silica glass fibers, Linear scattering losses, Non-Linear scattering losses, Fiber bend losses, Dispersion, Intramodal dispersion, Intermodal dispersion.

OPTICAL FIBER CONNECTION: JOINTS AND COUPLERS: Introduction, Fiber alignment and joint loss, Fiber splices, Fiber Connectors, Expanded beam connectors, Fiber Optic couplers.

UNIT – III

OPTICAL SOURCES1: THE LASER: Introduction, Basic concepts, Optical emission from semiconductors, The semiconductor injection laser, Some injection laser structures, Single frequency injection lasers, Injection laser characteristics, Injection laser to fiber coupling ,Non semiconductor lasers, Narrow line width and wavelength tunable lasers, Mid- infrared lasers. **OPTICAL SOURCES2: THE LIGHT EMITTIMG DIODE**: Introduction, LED power and efficiency. **LED STRUCTURES:** Planar LED, Dome LED, Surface emitter LEDs, Edge emitter LEDs, Super luminescent LEDs, Lens coupling to fiber, LED characteristics. **OPTICAL DETECTORS**: Introduction, device types, optical detection principles.**SEMICONDUCTOR PHOTO DIODES WITHOUT INTERNAL GAIN:** P-I-N Photodiode, **SEMICONDUCTOR PHOTO DIODES WITH INTERNAL GAIN:** Avalanche Photodiode.

UNIT – IV

OPTICAL FIBER SYSTEMS1: INTENSITY MODULATION/DIRECT DETECTION: Introduction, **THE OPTICAL TRANSMITTER CIRCUIT:** Source limitations, LED drive circuits. The Optical Receiver circuit: The preamplifier, AGC, Equalization. **ADVANCED MULTIPLEXING STRATEGIES:** Optical time division multiplexing (OTDM), Wavelength division multiplexing(WDM). **OPTICAL FIBER MEASUREMENTS:** Optical Time Domain Reflectometry (OTDR).

TEXT BOOK:

1. John M Senior, Optical Fiber Communications: Principles and Practice, 2nd Edition, PHI, 2005.

REFERENCE BOOKS:

1. Henry Zanger and Cynthia Zanger, Fiber Optics: Communication and other Applications, Maxwell Macmillan Edition.
2. JC Palais, Fiber Optic Communications, 2nd Edition, PHI, 2001.
3. W.Tomasi, Advanced Electronic Communication Systems, Pearson Education, 2002.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
SUB CODE: 14EC803/A

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT I

ARTIFICIAL INTELLIGENCE (AI): History and Foundation, AI Techniques, Problem Solving With AI Models, Data Acquisition and Learning Aspects in AI.

PROBLEM SOLVING: Problem Solving Process, Formulating Problems, Problem Types and Characteristics, Problem Analysis and Representation, Performance Measuring, Problem Space and Search, Toy and Real World Problems.

General Search Algorithms, Uninformed Search.

UNIT II

INFORMED SEARCH: Best First Search, Greedy Search, A* Search, AO* Search, Local Search Algorithm and Optimization Problems.

INTELLIGENT AGENTS: Rationality and Rational Agent, Performance Measure, Rationality and Performance, Flexibility and Intelligent Agents, Types of Agents.

UNIT III

LEARNING: What Is Machine Learning?, Learning Paradigms, Learning Concepts, Methods and Models, Statistical Learning Methods, ANN Based Learning, Support Vector Machines (SVM), Multi-Agent Based Learning, Distributed Learning, Adaptive Learning.

LEARNING ALGORITHMS: Performance Matters, Active Learning, Learning Based on Limited Information.

UNIT IV

NEURAL NETWORK BASED LEARNING: History Development of Neural Networks, Concepts and Technologies of ANN, Feed-Forward NN, Feed-Back Networks, Pattern Associative Networks, Competitive Learning, Self-Organizing Map, Network Design Issues.

TEXT BOOKS:

1. Parag Kulkarni and Prachi Joshi, Artificial Intelligence: Building Intelligent Systems, PHI.

REFERENCE BOOKS:

1. Vinod Chandra S. S and Anand Hareendran S., David Artificial Intelligence and Machine Learning, PHI Publications.
2. S. Russel and P. Norvig, Artificial Intelligence – A Modern Approach Second Edition, Pearson Education, 2003.
3. Tom Mitchell, Machine Learning, McGraw-Hill, 1997.

SPEECH AND AUDIO PROCESSING
SUB CODE: 14EC803/B

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

FUNDAMENTALS OF SPEECH:

The Human Speech Production Mechanism, LTI Model for Speech Production, Nature of the Speech Signal, Linear Time-Varying Model, Phonetics, Types of Speech, Voiced and Unvoiced Decision Making.

UNIT – II

PARAMETERS OF SPEECH: PITCH AND FORMANTS:

Fundamental Frequency or Pitch Frequency, Parallel Processing Approach for Calculation of Pitch and Frequency, Pitch Period Measurement Using Spectral Domain, Cepstral Domain, Formants and Their Relation With LPC, Evaluation of Formants Using Cepstrum, Evaluation of Formants Using Log Spectrum, Evaluation of Formants Using Power Spectral Density Estimate.

UNIT – III

LINEAR PREDICTION OF SPEECH:

Lattice Structure Realization, Forward Linear Prediction, Autocorrelation Method, Covariance Method, Lattice Methods, Selection of Order of the Predictor, Line Spectral Frequencies/Line Spectral Pair Frequencies.

UNIT – IV

SPEECH QUANTIZATION AND CODING:

Uniform and Non-Uniform Quantizers and Coder, Companded Quantizers, Uniform Quantization of Non-uniform Sources: Adaptive Quantizers, Waveform Coding of Speech, Comparison of Different Waveform Coding Techniques, Parametric Speech Coding Techniques, Sinusoidal Speech Coding Techniques, Mixed Excitation Linear Prediction Coder, Multi-Mode Speech Coding (Hybrid Coder), Transform Domain Coding of Speech.

TEXT BOOK:

1. Dr. Shaila D. Apte, Speech and Audio Processing, Wiley India Edition.

REFERENCE BOOKS:

1. Rabiner L.R. & Schafer R.W., Digital Processing of Speech Signals, Prentice Hall Inc.
2. O'Shaughnessy, D. Speech Communication, Human and Machine. Addison-Wesley.
3. Thomas F. Quatieri, Discrete-time Speech Signal Processing: Principles and Practice, Prentice Hall.
4. Rabiner L.R. & Gold, Theory and Applications of Digital Signal Processing, Prentice Hall of India.

INFORMATION THEOREY AND CODING
SUB CODE: 14EC803/C

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

SOURCE CODING: Mathematical models of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, coding for discrete memory less Sources, Properties of Codes, Huffman Code, Run Length Codes.

UNIT – II

CHANNEL CODING : Introduction to Linear Block Codes, Generated Matrix, Systematic Linear Block Codes, Encoder Implementation of Linear Block Codes, Parity Check Matrix, Syndrome Testing, Error Detecting and Correcting Capability of Linear Block Codes, Hamming Codes.

UNIT – III

CYCLIC CODES: Algebraic Structure of Cyclic Codes, Binary Cyclic Code Properties, Encoding in Systematic Form, Syndrome Computation and Error Detection, Decoding of Cyclic Codes, Cyclic Hamming Codes BCH Codes: Description of the Codes, Minimum Distance and BCH Bounds, Decoding Procedure for BCH Codes.

UNIT-IV

CONVOLUTIONAL CODES: Encoding of Convolutional Codes, Structural Properties of Convolutional Codes, State Diagram, Tree Diagram, Trellis Diagram, Maximum, Likelihood Decoding of Convolutional Codes, Viterbi Algorithm.

TEXT BOOKS:

1. Error Control Coding – Fundamentals and Applications by SHU LIN and Daniel J. Costello, JR., Prentice Hall Inc.
2. Simon Haykin – Communication Systems, 4th edition.

REFERENCE BOOKS:

1. Digital Communications – Fundamentals and Applications by Bernard Sklar, Pearson Education Asis, 2003.
2. Digital Communications – John G. Proakis, Mc. Graw Hill Publications.
3. J. Das, Sk. Mallik, PK Chattergee – Princiiples of Digital Communication NAI (P) Ltd, 2000.

MOBILE COMMUNICATIONS
SUB CODE: 14EC803/D

Lectures: 4	Tutorial: 1	Practical: 0	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

INTRODUCTION TO MOBILE COMMUNICATION: Evolution of Mobile Radio Communication, Mobile Radio Telephony in US and around the world, Examples of Wireless Communication Systems: Paging system, Cordless telephones systems, Cellular telephone Systems, Trends in Cellular Radio and personal Communications.

THE CELLULAR CONCEPT: Frequency reuse, Channel Assignment strategies, Hand off Strategies, Interference and system capacity, Improving coverage and capacity in cellular systems.

UNIT – II

MOBILE RADIO PROPAGATION: Large Scale Fading: Introduction, Free space propagation model, Relating power to electric field, The Three basic propagation mechanisms: Reflection, Ground reflection (Two-Ray) model, Diffraction, scattering, **SMALL SCALE FADING:** Small-scale Multipath Propagation, Impulse response model of a multipath channel, Parameters of mobile multipath channels, Types of small scale fading: Fading effects due to multipath time delay spread and Doppler spread Rayleigh and Ricean distributions.

EQUALIZATION: Fundamentals of equalizers, Training a generic adaptive equalizer, Equalizers in a communication receiver, survey of equalization techniques, Linear equalizers, Nonlinear equalizers: Decision feedback equalizers, Maximum likelihood sequence Estimation (MLSE) equalizer. **Diversity TECHNIQUES:** Space diversity: Selection diversity, feedback, MRC, EGC diversity, Polarization diversity, Frequency diversity, Time diversity, Rake Receiver.

UNIT – III

WIRELESS NETWORKING (2G): GLOBAL SYSTEM FOR MOBILE (GSM): services and features, system architecture, Radio subsystem, channel types, Example of a GSM call, Frame structure for GSM, signal processing in system. CDMA digital cellular standard (IS – 95): Frequency and channel specifications, Forward CDMA channel and Reverse CDMA channel.

UNIT – IV

WIRELESS NETWORKING (3G): MOBILE SERVICES (3G): Paradigm Shifts in 3G Systems, W-CDMA and CDMA 2000, 3G TD-SCDMA, WLL, WLANs, Quality of service in 3G, Wireless OS for 3G handset, 3G systems and field trials, Other trail systems, Impact on manufacture and operator technologies.

TEXT BOOKS:

1. Theodore S. Rappaport, Wireless Communications Principles and Practice, 2ndEdition, Pearson Education, 2003 (UNIT I, II, III).
2. Yi-BingLin, ImrichChlamtac, Wireless and Mobile Network architectures, Wiley, 2001(UNIT IV).

REFERENCE BOOKS:

1. KamiloFeher, Wireless Digital Communications, PHI, 2003.
2. W.C.Y. Lee, Mobile Cellular Communications, 2nd Edition, MC Graw Hill, 1995.
3. P. Nicopolitidis, Wireless Networks, Wiley, 2003.

NEURAL NETWORKS
SUB CODE: 14EC804/A

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

INTRODUCTION: History of Neural Networks, Structure and functions of biological and artificial neuron, neural network architectures, Learning methods, evaluation of neural networks.

UNIT – II

SUPERVISED LEARNING – I: Single layer networks, McCulloch – Plus Neuron, Model Perceptron learning, Delta learning Widrow – Hoff learning rules, linear seperability, Adaline and modifications.

UNIT – III

SUPERVISED LEARNING – II: Multilayer networks: Architectures, Madalines, Backpropagation algorithm, importance of learning parameter and momentum term, radial basis functions, polynomial networks.

UNSUPERVISED LEARNING: Winner – Take – all learning, out star learning, learning vector quantizers, counter propagation networks, Kohonen self-organizing networks, Grossberg layer, adaptive resonance theory, Hamming Net.

UNIT – IV

ASSOCTATIVE MEMORIES: Hebbian learning rule, continuous and discrete, Hopfield networks, recurrent and associative memory, Boltzman machines, Bi-directional associative memory.

APPLICATIONS OF NEURAL NETWORKS: Optimization, Travelling Salesman, Problem solving simultaneous linear equations.

TEXT BOOK:

1. Kishan Mehrotra, Chelkuri K. Mohan, SanjavRanka, elements of Artificial Neural Networks, Tenram International.

REFERENCE BOOKS:

1. J.M. Zurada Introduction to Artificial Neural Systems, Jaico Publications.
2. B. Yegnanarayana, Artificial Neural Networks, PHI, New Delhi.
3. Waserman: Neural Computing – Theory and Practice.

ADVANCED MICROCONTROLLERS
SUB CODE: 14EC804/B

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT – I

Computer Architectures: RISC/CISC and Harvard/Princeton Architectures. Introduction: The 8051 Microcontroller, Criteria for choosing a microcontroller, 8051 Family members & block diagram. The 8051 Assembly Language Programming: 8051internal registers, Structure of Assembly Language, Program Counter & ROM Space, Data types & Directives, PSW, Register Banks & Stack. JMP, LOOP & CALL Instructions: Looping, Conditional & unconditional jump, LCALL, ACALL, PUSH, POP instructions & Subroutines. Time Delay Generation & Calculation.

UNIT-II

I/O Port Programming: Pin description, I/O Ports, Bit addressability & Read modify-write feature. Addressing Modes: Addressing modes, Indexed addressing & Look up tables, SFR registers and their addresses. Arithmetic & Logical Instructions: Addition, subtraction, BCD numbers and DAA instruction, multiplication and division, signed number and overflow problem in arithmetic operations. Logic & Compare Instructions, Rotate & Swap Instructions, BCD & ASCII conversion programs.

UNIT – III

Single Bit Instructions: Single bit instructions, Registers & bit addressability, Bit addressable RAM, Reading input pins Vs. Port Latch. 8051Timer /Counter Programming: Timer registers, TMOD Register, Timer mode 1, mode 2, mode 3 programming. Counter programming. 8051 Serial Communication: Basics of serial communication, Asynchronous serial communication & data framing, RS 232 standards, MAX 232. Baud rate selection & T1 register, SBUF, SCON Registers, and Serial port Programming to transmit & receive data serially.

UNIT – IV

8051 Interrupts Programming: 8051 interrupts, IVT for 8051, IE register, TCON register and Timer Interrupts, External H/W Interrupts Programming. Serial Port Interrupts programming, Interrupt Priority upon reset and IP register. Real World Interfacing: LED, Switches, LCD, ADC, DAC, Sensors, Stepper Motor, Keyboard, and Memory

TEXT BOOKS:

1. 8051 Microcontroller and Embedded Systems: M.A. Mazidi & J. G. Mazidi, Pearson Education.
2. Microcontrollers: Architecture, Programming & System Design: Rajkamal Pearson Education.
3. 8051 Microcontrollers Arch., Programming & Applications: K. J. Ayala Penram International.

SOFTWARE DEFINED RADIO
SUB CODE: 14EC804/C

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT - I

Introduction – Software Defined Radio – A Traditional Hardware Radio Architecture – Signal Processing Hardware History – Software Defined Radio Project Complexity.

A Basic Software Defined Radio Architecture – Introduction – 2G Radio Architectures, Hybrid Radio Architecture- Basic Software Defined Radio Block Diagram- System Level Functioning Partitioning-Digital Frequency Conversion Partitioning.

UNIT - II

RF System Design – Introduction- Noise and Channel Capacity- Link Budget- Receiver Requirements- Multicarrier Power Amplifiers- Signal Processing Capacity Tradeoff.

Analog-to-Digital and Digital-to-Analog Conversion- Introduction – Digital Conversion Fundamentals- Sample Rate- Bandpass Sampling- Oversampling- Antialias Filtering – Quantization – ADC Techniques-Successive Approximation- Figure of Merit-DACs- DAC Noise Budget- ADC Noise Budget.

UNIT – III

Digital Frequency Up- and Down Converters- Introduction- Frequency Converter Fundamentals- Digital NCO- Digital Mixers- Digital Filters- Halfband Filters- CIC Filters Decimation, Interpolation, and Multirate Processing-DUCs - Cascading Digital Converters and Digital Frequency Converters.

UNIT – IV

SIGNAL PROCESSING HARDWARE COMPONENTS- Introduction- SDR Requirements for Processing Power- DSPs- DSP Devices- DSP Compilers- Reconfigurable Processors Adaptive Computing Machine- FPGAs

TEXT BOOKS:

1. Paul Burns, Software Defined Radio for 3G, Artech House, 2002.
2. Tony J Rouphael, RF and DSP for SDR, Elsevier Newnes Press, 2008.
3. JoukoVanakka, Digital Synthesizers and Transmitter for Software Radio, Springer, 2005.
4. P Kenington, RF and Baseband Techniques for Software Defined Radio, Artech House.

ADAPTIVE SIGNAL PROCESSNG
SUB CODE: 14EC804/D

Lectures: 4	Tutorial: 0	Practical: 0	Self Study: 1
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

UNIT - I

ADAPTIVE SYSTEMS:- Definitions and Characteristics, Areas of Applications, General Properties, Open and Closed-Loop Adaptation, Example of an Adaptive System.

The Adaptive Linear Combiner:- General Description, Input Signal and Weight Vectors, Desired Response and Error, Performance Function, Gradient and Minimum Mean-Square Error, Example of a performance Surface, Alternative Expression of the Gradient, Decorrelation of Error and Input Components.

UNIT - II

PROPERTIES OF THEQUADRATIC PERFORMANCE SURFACE:- Normal form of the Input Correlation Matrix, Eigenvalues and Eigenvectors of the Input Correlation Matrix, Example with Two Weights, Geometrical Significance of Eigenvectors and Eigenvalues.

Searching the Performance Surface:- Methods of searching the performance surface, Basic Ideas of Gradient Search Methods, Gradient Searching Algorithm and its Solution, Stability and Rate of Convergence, The Learning Curve, Gradient Search by Newton's Method, Multidimensional Space, Gradient search by the Method of Steepest Descent, Comparison of Learning Curves.

UNIT - III

GRADIENT ESTIMATION AND ITS EFFECTS ON ADAPTION:- Gradient Component Estimation by Derivative Measurement, The Performance Penalty, Derivative Measurement and Performance Penalties with Multiple Weights, Variance of the Gradient Estimate, Effects on the Weight-vector solution, Excess Mean-Square Error and Time Constants.

The LMS Algorithm:- Derivation of the LMS Algorithm, Convergence of Weight Vector, An example of Convergence, Learning Curve, Noise in the Weight – Vector Solution.

UNIT - IV

ADAPTIVE MODELING AND SYSTEM IDENTIFICATION: General Description, Adaptive Modeling of a Multipath Communication Channel, Adaptive Modeling in Geophysical Exploration, Adaptive Modeling in FIR Digital Filter Synthesis.

TEXT BOOK:

1. Bernard Widrow – Adaptive Signal Processing, PH/Pearson Education, Asia.

REFERENCE BOOKS:

1. Sophocles J. Orfamidis - Optimum Signal Processing – An Introduction, 2nd Edition, McGraw Hill.
2. S. Thomas Alexander – Adaptive Signal Processing – Theory and Applications, Springer – Verlag.

MICROWAVE AND OPTICAL COMMUNICATION LAB
LAB CODE: 14ECL801

Lectures: 0	Tutorial: 0	Practical: 3	Self Study: 0
Continuous Internal Assessment: 40		Semester End Examination (3 Hours): 60	

LIST OF EXPERIMENTS

Based on Microwave Engineering

1. Characteristics of Reflex Klystron.
2. Verification of the Expression $1/\lambda_0^2 = 1/\lambda_g^2 + 1/\lambda_c^2$
3. Measurement of VSWR using Microwave Bench.
4. Determination of Characteristics of a Given Directional Coupler.
5. Study of Cellular Communication.

Based on Optical Communication

6. Fiber Optics Cable: Numerical Aperture Measurement.
7. Measurement of Coupling and Bending Losses of a Fiber.
8. Analog Link set up using a Fiber.
9. Digital Link set up using a Fiber.
10. Set up of Time Division Multiplexing using Fiber Optics.

Based on Software Defined Radio

11. FM Transmitter design.
12. FM Receiver design.
13. Pulse Shaping Using USRP.
14. Voice Transmission.
15. Equalizer design.

NOTE: A minimum of 10(Ten) experiments, choosing a minimum of 3 (Three) from each part, have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.