Ordinance No. V(2A)

Bachelor of Technology

(B.Tech.)

(Discipline: Electronics & Communication Engineering)

Faculty of Engineering & Technology

SWAMI VIVEKANAND SUBHARTI UNIVERSITY,

MEERUT

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING
ORDINANCE No. V (2A) RELATING TO
BACHELOR OF TECHNOLOGY (B.Tech.) PROGRAMME (As per AICTE)

(Effective from the Session – 2018-19)

General

1. This ordinance may be called **"Ordinance Relating to Bachelor of Technology(B.Tech)"** Programme**.**
2. It shall come enforced with immediate effect from session 2018-19.
3. This supersedes the previous Ordinance relating to Bachelor of Technology (B.Tech) Programme ordinance no. [V (2A)].
4. The degree "Bachelor of Technology" acronym as B.Tech shall be of four years (eight semesters) in the branches of Engineering prevalent in the institute at a point of time based on Choice Based Credit System (CBCS) as per AICTE guidelines.

CHAPTER – 1

1.1 Introduction

Chhatrapati Shahuji Subharti Institute of Technology and Engineering is a constituent Institute of Swami Vivekanand Subharti University, Meerut has been established in 2005 with the vision we make every decision to support the career and personal development of our learners. Our curriculum, teaching and services demonstrate that we value the diverse profiles of our learners. The University boasts of highly qualified, dedicated and competent faculty from all walks of life, world class infrastructure, fully equipped Laboratories with latest state-of-the-art equipment and a huge library with recent knowledge resources including e-resources. Swami Vivekanand Subharti University providing a safe and healthy working environment for teaching and non-teaching employees, students, and visitors etc.

1.2 Vision

To become a dynamic, demand driven, quality conscious, efficient and innovative institute capable of becoming active partner in the techno-economic growth of the Nation and to provide world class technological education and research inputs to the society.

1.3 Mission

Strive to create centre of excellence in specialized areas of technology and enable its academic beneficiaries to become competent professionals capable of providing sustainable solutions to challenging problems of the society and industry.

1.4 Programme Educational Objectives (PEOs):

The Programme Educational Objectives of B.Tech. programmes are:

PEO1. To prepare graduates who will be successful professionals in industry, government,academia, research, entrepreneurial pursuit and consulting firms

PEO2. To prepare graduates who will contribute to society as broadly educated, expressive,ethical and responsible citizens with proven expertise

PEO3. To prepare graduates who will achieve peer-recognition; as an individual or in a team;through demonstration of good analytical, design and implementation skills

PEO4. To prepare graduates who will thrive to pursue life-long learning to fulfill their goals

1.5 Programme Outcomes (POs):

Engineering programmes are designed to prepare graduates to attain the following program outcomes:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineeringfundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complexengineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions**: Design solutions for complex engineeringproblems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems**: Use research-based knowledge andresearch methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, andmodern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge toassess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: Understand the impact of the professionalengineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilitiesand norms of the engineering practice.

PO9. **Individual and team work**: Function effectively as an individual, and as a member orleader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with theengineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one"s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability toengage in independent and life-long learning in the broadest context of technological change.

CHAPTER-2

Eligibility for Admission

2.1 (i) An applicant is eligible for admission in the 1 Year of the B.Tech. programme provided that, he/she should be at least 17 years on 31 December of the year of admission. The upper age limit for taking admission in Under Graduate programme will be 30 years. (as per SVSU Letter No. U-07/SVSU/2016/374 dated 16.08.2016)

An applicant should have passed intermediate examination or an equivalent examination from any recognized board/university with Physics, Mathematics as compulsory subjects, Chemistry/Bio-technology/Computer Science/Biology as one of the optional subjects.

The admission shall be considered purely on the basis of merit in the University entrance test and counseling conducted by the university. The applicant who have 45 % of marks (40 % for SC/ST) [as per AICTE norms*] or more in the above mentioned three subjects and not less than 45 % marks (40 % for SC/ST) in the optional subjects will be considered for direct admission against seats, which might not have been filled up through the examination and counseling.

The applicant who has obtained a two/three year Engineering Diploma with Minimum (45 %) aggregate marks from a recognized Institute/University will be considered eligible for direct admission in the second year of the B.Tech programmes.

The applicant having a three year B.Sc. degree with Mathematics with a minimum of 40 % marks in aggregate from a recognized university will be considered eligible for direct admission in the second year of the B.Tech programmes. Provided that the students belonging to B.Sc. Stream, shall clear the subjects Engineering Graphics/Engineering Drawing and Engineering Mechanics of the First Year Engineering Programme along with the Second year subjects.

Provided that the students belonging to B.Sc. Stream shall be considered only after filling the supernumerary seats in this category with students belonging to the Diploma Stream.

6 Subject to moderation in accordance with the guidelines of AICTE

2.2 The B.Tech. programme is available in the following discipline:

(i) Computer Science & Engineering

(ii) Information Technology

(iii) Electrical & Electronics Engineering

(iv) Electronics & Communication Engineering

(v) Mechanical Engineering

(vi) Civil Engineering

2.3 Selected candidates shall be allocated a discipline from those listed in clause 2.2 on the basis of merit, choice and counseling.

2.4 Request for change in discipline may be considered on the basis of merit in the entrance examination provided that the seat remains vacant after the last date for admission in B.Tech. programme.

2.5 After 2nd Semester, a student can apply for change of branch which shall be considered on the following grounds:

1. Availabilities of seats in branch as per sanctioned intake by AICTE.

(ii) The students should have passed 1st and 2nd Semester examination without any carry over paper.

1. The branch from which the students will be shifted must not fall below 75 % of its sanctioned intake.

2.6 The change of discipline shall be allowed only once during the programme.

CHAPTER-3

Teaching Course

3.1 The programme will be of four years duration, divided in to eight semesters.

3.2 The duration of the B. Tech. programme for the candidates admitted in semester I will be four academic years (eight semesters).

3.3 The duration of the B. Tech. programme for the candidates admitted in semester III (lateral entry) will be three academic years (six semesters).

3.4 Annual academic calendar shall be published by the University.

3.5 There shall be normally 14 weeks of teaching in every semester.

3.6 Study & evaluation scheme is enclosed as an Annexure A1-A7.

CHAPTER-4

Curriculum/Structure

4.1 The programme shall be spread over four academic years, spread over eight semesterscomprising actual teaching for a minimum of 90 days in each semester.

4.2 The programme focuses on the following aspects:

- Competency
- Entrepreneurship
- Skill Enhancement
- Value Added Courses
- Extracurricular activities

4.3 Choice Based Credit System (CBCS) :

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising Professional/Program Core Courses (PCC), Professional/Program Elective Courses (PEC), Engineering Science Courses (ESC), Basic Sciences Courses (BSC), Humanities and Social Sciences including Management Courses (HSMC) Mandatory Courses(MC) and Open Elective Courses (OEC). The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student"s performance in examinations, the UGC has formulated the guidelines to be followed.

4.3.1 Structure of Undergraduate programs

The four year B. Tech. programme compromise of courses divided in seven distinct areas, namely: Professional/Program Core Courses (PCC), Professional/Program Elective Courses (PEC), Engineering Science Courses (ESC), Basic Sciences Courses (BSC), Humanities andSocial Sciences including Management Courses (HSMC) Mandatory Courses (MC) and OpenElective Courses (OEC). All the courses offered in first year B. Tech. programs are categorized as „Common Courses" for all the academic programs. Credits assigned and curricularcomponents of the B. Tech. curriculum are given in Annexure A1-A7.

Professional/Program Core Courses (PCC)

The departmental core consists of courses considered essential for a chosen Engineering/Science discipline including, Engineering design, Seminar, Industrial Training and Project (PROJ).

Professional/Program Elective Courses (PEC)

The students are required to complete a specific number of elective courses. Every department offers a wide variety of elective courses to students providing them opportunity to discover their academic interest and enhancing their engagement in learning process.

Open Elective Courses (OEC)

The Open Electives courses are offered by different academic departments to the students of all disciplines. A wide range of elective courses is available with each branch. When a student opts elective courses offered in his/her program it will be termed as OE.

Humanities and Social Sciences including Management Courses (HSMC)

The Humanities, Social Sciences and Management Courses consist of courses considered essential for a B.Tech. program to inculcate the essence of technical writing, communication skills, economics and analysis, management and professional ethics & human values.

Basic Sciences Courses (BSC)

The Applied Sciences and Mathematics Courses consist of courses considered essential for a B.Tech. program to build the foundation for learning of engineering core courses.

Engineering Science Courses (ESC)

The students are required to complete a minimum number of Allied engineering courses (majority of them taught as common courses) offered by engineering departments other than his/her parent department. These courses expose the student with wide spectrum knowledge of allied engineering domain connected to the main engineering stream of the course of study of the students of concerned departments.

Mandatory Courses (MC)

The mandatory courses considered essential for a B.Tech. programme to inculcate the essence of Environmental Sciences, Induction program, Indian Constitution, Essence of Indian Knowledge Tradition etc.

4.4 <u>Induction Program</u>

Three weeks duration Induction program for students to be offered right at the start of the first year. These activities are listed under following 7 heads:

1 Physical and Health
2 Culture
3 Literature and Media
4 Social Service
5 Self development
6 Nature and Environment
7 Innovation

4.5 The academic calendar shall be as follows:-

I , III , V, VII Semester (Odd)	Session - 1st Aug. to 30th Nov Exam - 1st Dec. to 20th Dec.
II, IV, VI, VIII Semester (Even)	Session - 1st Jan. to 10th May Exam - 1st May to 20th May

CHAPTER-5

Attendance

5.1 The students are expected to attend all the classes and should not have less than 75 % attendance in theory as well as in practical classes, wherever held, to become eligible to appear for the university examination. Short fall in attendance can, however be condoned in deserving cases to the extent of 10 % by the Principal. If the short fall is more than 10 % but not more than 15 %, the Principal may recommend deserving cases to the Vice Chancellor for condo-nation. The order of the Vice Chancellor in this regard shall be final.

CHAPTER-6

Examination

All Courses offered by SITE will have an evaluation system within two components as:

1. Continuous Comprehensive Assessment (CCA) accounting for 30% of the final grade that a student gets in a course, and

2. End-Semester Examination (ESE) accounting for the remaining 70% of the final grade that the student gets in a course.

A student will have to pass both the components i.e. CCA and ESE separately to become eligible to be declared successful in a course.

6.1 Continuous Comprehensive Assessment (CCA)

Award of Sessional Marks:

Sessional marks for theory subjects and practicals and shall be awarded as per the breakup of sessional marks given below:-

\endash **Theory Subjects :**

(a) Class test will comprise two mid-term test of equal weightage. -**20 Marks**

(b) Marks for regular class attendance - **10 Marks**

2. Practical :

(a) Two–mid-term viva-voce test of equal weightage. - **5 Marks**

1. Teacher"s assessment (including 5 marks for regular attendance) based on lab record attendance - **10 Marks**

5. Make-up test may be held for those students who fail to appear in any one of the mid-term class test due to genuine unavoidable reasons, provided prior permission was consented from the Principal.

6. A maximum of 10 marks in each subject shall be awarded for attending classes (theory/practical) as per the following norms:

85 % or more attendance	2.	10 Marks
80 % or more but less than 85 % attendance	3.	09 Marks
75 % or more but less than 80 % attendance	4.	08 Marks
70 % or more but less than 75 % attendance	5.	07 Marks
65 % or more but less than 70 % attendance	6.	06 Marks
60 % or more but less than 65 % attendance	7.	05 Marks
51 % or more but less than 60 % attendance	8.	04 Marks
50 % attendance	9.	01 Marks
Less than 50 % attendance	10.	0 Marks

6.2 **Award of General Proficiency Marks:**

The marks in General Proficiency shall be awarded on the following basis:-

(i) Co-curricular & Extra-curricular activities (games, sports, cultural and literary activities etc.) **50%**

(ii) Discipline inside and outside the college campus (including 10 marks for regular attendance) **50%**

6.3 The marks for seminar, industrial training and educational tour shall be awarded on the following basis:

(i) Write-up/Report 50%

(ii) Presentation 50%

6.4 END SEMESTER EXAMINATION (ESE)

The remaining 70% of the final grade of the student in a course will be assessed on the basis of an end semester examination (ESE) that will be for three hours duration and will cover the entire syllabus of the course. The question papers for the ESE will be got set by the Controller of Examinations (COE) of the Swami Vivekanand Subharti University (SVSU) by a selected faculty panel.

6.5 The entire programme has to completed within a maximum of seven years from the date of original admission in the programme by those students who are admitted in the first year and within six years by those admitted directly in the Second Year, [Vide clause 2.1 (iv, v)]

CHAPTER-7

Paper Setting

7.1 The work of setting the end semester examination papers and evaluation of scripts and conduct of the end semester practical examination shall be assigned to the course teachers as well as to outsiders, ordinarily in the ratio of 50:50 for internal and external valuation respectively.

Results

7.2 The result shall be prepared at the end of each academic year of the programme by aggregating the marks obtained in the theory and practical examinations in all the semesters of the programme till date.

(a) The minimum passing marks in each theory subject (including sessional marks) shall be 40% and 50% in aggregate. The minimum pass marks in a project/ Practical subject (including sessional marks if any), Seminars, Industrial Training and Educational Tour, Viva-Voce etc. shall be 50%.

(b) If a student obtained 40% marks in at least 50% of the papers (ignoring fractions) including project report, he/she will be provisionally promoted to the next year with carryover papers and will have to appear & obtain pass marks in carryover papers along with the subsequent regular examinations for the relevant semester.

(c) If a candidate fails in only one head/subject and having passed in all other head/subject of the given examination of the year than his/her deficiency of maximum five (05) marks may be fulfilled by grace marks after fulfilling the conditions given below:

7.3 If a candidate fails in only one head/subject and having passed in all other heads/subjects of the given examination of a **semester*/year**, then his/her deficiency of marks may be fulfilled by grace marks under the following conditions:-

(i) Grace marks is not a matter of right of the student but is the discretion of the University.

(ii) Provided that the candidate has appeared in the main examination of the concerned programme and falls short of pass marks by not more than five (05) marks in theory paper only. Benefit of above mentioned shall not be given to the candidate who had appeared in supplementary/special examination/carry over examination.

(iii) Further, benefit of grace marks may be given only to the candidate who will pass the entire concerned examination of the **semester*/year** after awarding the grace marks and not for the purpose of promoting the student to next year with back papers or for improvement of division or percentage.

(iv) If in a head/subject of an examination passing in Theory, Practical or sessional exams separately is mandatory, then the benefit of grace marks shall be given only in Theory examination of the University examination.

(v) The award of grace marks permissible shall be on the basis of 1 grace mark for every 05 marks secured by an examinee over and above the minimum passing aggregate marks of all subjects of the year.

7.4 Awarding of Grace Marks shall be done as given below:-

Aggregate Marks Obtained over & above minimum passing marks	Permissible Grace Marks
1-5	1
6-10	2
11-15	3
16-20	4
21-25	5

Total number of Grace Marks given to the student will be marked with astrick (*) at the bottom of the mark sheet.

* Grace Mark in semester examination will be considered hereinafter.

A student not covered by clause 7.2 (a) to (c) above shall have the following options to complete his/her programme -

(i) He/ she may take admission on payment of full annual programme fee and repeat the entire year of study. He /She shall be treated as a regular student. Or

(ii) He /She may pay only University exam fee for the End Semester Examination and appear in the End Semester University exams directly. He /She shall not be allowed to attend classes and the Sessional marks obtained earlier shall be retained. Or

(iii) He /She may pay half of the annual programme fee and attend classes. The sessional marks obtained by him/her earlier shall be retained. There will not be any requirement of minimum attendance for appearing in the University examination

7.5 A student will not be promoted to the next academic year if the carryover papers are more than 50% at one point of time.

Evaluation under Grading Assessment

7.6 The minimum Grade/ Grade Point required to pass each paper in a semester examination under CBCS shall be Grade D/ Grade Point 4 in each theory paper/ Practical/Project (wherever applicable) in External Examination and Internal Assessment separately.

Calculation Criteria

7.7 To implement the following grading system, the colleges/campuses shall use the following UGC recommended 10 point grading system:

Marks (%)	Letter Grades	Grade Points (G)
85-100	A++ (Outstanding)	10
75 to < 85	A+ (Excellent)	9
70 to <75	A (Very Good)	8
65 to <70	B+ (Good)	7
60 to <65	B (Above Average)	6
50 to <60	C (Average)	5
40 to <50	D (Pass)	4
0 to <40	F (Fail)	0
	AB (Absent)	0

7.8 Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

$$(Si) = \sum (Ci \times Gi) / \sum Ci,$$

where Ci is the number of credits of the i_{th} programme and Gi is the grade point scored by the student in the ith programme.

$$CGPA = \sum (Ci \times Si) / \sum Ci$$

where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts

CHAPTER-8

Power to Modify

8.1 In the event of any emergent situation, if any deviation is considered necessary, the Vice-Chancellor is authorized to modify the ordinance. Subjected to subsequent ratification by the executive council.

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

EVALUATION SCHEME & SYLLABUS

B.TECH.
(ELECTRONICS & COMMUNICATION ENGG.)

W.E.F. SESSION 2018-19

SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING
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SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

STUDY & EVALUATION SCHEME

B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING

YEAR 1ST, SEMESTER-I

S. No.	COURSE CODE	COURSE TITLE	COURSE TYPE	TEACHING LOAD PER WEEK			MARKS				TOTAL MARKS	CREDIT
							CCA			ESE		
				L	T	P	CT	AT	TOTAL			
		THEORY SUBJECTS										
1	BAS101/ BAS102	Physics/ Chemistry	BSC-1/ BSC-2	3	1	0	20	10	30	70	100	4
2	BAS103	matics- I	BSC-3	3	1	0	20	10	30	70	100	4
3	BEEE101/ BCSE101	Electrical Engineering/ Programming for Problem Solving	ESC-1/ ESC-2	3	1	0	20	10	30	70	100	4
		PRACTICALS										
4	BAS 151/ BAS 152	Physics Lab/ Chemistry Lab	BSC-6/ BSC-7	0	0	3	10	5	15	35	50	1.5
5	BEEE151/ BCSE151	Electrical Engineering Lab/ Programming for Problem Solving Lab	ESC-3/ ESC-4	0	0	2	10	5	15	35	50	1
6	BME151/ BME152	Engineering Graphics & Design Lab / Workshop Practice Lab	ESC-5/ ESC-6	1	0	4	10	5	15	35	50	3
		TOTAL									**450**	**17.5**

L- Lecture
T- Tutorial
P- Practical
CT- Cumulative Test
AT - Attendance
CCA- Continuation Comprehensive Assessment
ESE- End Semester Examination

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

STUDY & EVALUATION SCHEME

B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING

YEAR 1ST, SEMESTER-II

S. No.	COURSE CODE	COURSE TITLE	COURSE TYPE	TEACHING LOAD PER WEEK			MARKS				TOTAL MARKS	CREDIT
							CCA			ESE		
				L	T	P	CT	AT	TOTAL			
		THEORY SUBJECTS										
1	BAS201/ BAS202	Physics/ Chemistry	BSC-1/ BSC-2	3	1	0	20	10	30	70	100	4
2	BAS203	matics- II	BSC-4	3	1	0	20	10	30	70	100	4
3	BEEE201/ BCSE201	Electrical Engineering/ Programming for Problem Solving	ESC-1/ ESC-2	3	1	0	20	10	30	70	100	4
4	BHU201	Professional English	HSMC-1	2	0	0	20	10	30	70	100	2
		PRACTICALS										
5	BAS251/ BAS252	Physics Lab/ Chemistry Lab	BSC-6/ BSC-7	0	0	3	10	5	15	35	50	1.5
6	BEEE251/ BCSE251	Electrical Engineering Lab/ Programming for Problem Solving Lab	ESC-3/ ESC-4	0	0	2	10	5	15	35	50	1
7	BME251/ BME252	Engineering Graphics & Design Lab / Workshop Practice Lab	ESC-5/ ESC-6	1	0	4	10	5	15	35	50	3
8	BHU251	English Lab	HSMC-2	0	0	2	10	5	15	35	50	1
		TOTAL									**600**	**20.5**

L- Lecture
T- Tutorial
P- Practical
CT- Cumulative Test
AT - Attendance
CCA- Continuation Comprehensive Assessment
ESE- End Semester Examination

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

STUDY & EVALUATION SCHEME

B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING

YEAR 2ND, SEMESTER-III

S. NO.	COURSE CODE	COURSE TITLE	COURSE TYPE	TEACHING LOAD PER WEEK			MARKS				TOTAL MARKS	CREDIT
							CCA			ESE		
				L	T	P	CT	AT	TOTAL			
		THEORY SUBJECTS										
1	BECE301	Electronic Devices	PCC-1	3	0	0	20	10	30	70	100	3
2	BECE302	Digital System Design	PCC-3	3	0	0	20	10	30	70	100	3
3	BECE303	Signals and Systems	PCC-5	3	0	0	20	10	30	70	100	3
4	BECE304	Network Theory	PCC-6	3	0	0	20	10	30	70	100	3
5	BECE305	Basics of Electronics Engineering	ESC-7	3	0	0	20	10	30	70	100	3
6	BAS302	Mathematics-III	BSC-5	3	0	0	20	10	30	70	100	3
7	BMC301-305	Mandatory Course	MC-1	2	0	0	20	10	30	70	100	0
		PRACTICALS										
8	BECE351	Electronic Devices Lab	PCC-2	0	0	2	10	5	15	35	50	1
9	BECE352	Digital System Design Lab	PCC-4	0	0	2	10	5	15	35	50	1
		TOTAL									**800**	**20**

L- Lecture
T- Tutorial
P- Practical
CT- Cumulative Test
AT - Attendance
CCA- Continuation Comprehensive Assessment
ESE- End Semester Examination

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

STUDY & EVALUATION SCHEME

B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING

YEAR 2ND, SEMESTER-IV

S. NO.	COURSE CODE	COURSE TITLE	COURSE TYPE	TEACHING LOAD PER WEEK			MARKS				TOTAL MARKS	CREDIT
							CCA			ESE		
				L	T	P	CT	AT	TOTAL			
		THEORY SUBJECTS										
1	BECE401	Analog and Digital Communication	PCC-7	3	0	0	20	10	30	70	100	3
2	BECE402	Analog Circuits	PCC-9	3	0	0	20	10	30	70	100	3
3	BECE403	Microcontrollers	PCC-11	3	0	0	20	10	30	70	100	3
4	BECE404	Digital Electronics	ESC-8	3	0	0	20	10	30	70	100	3
5	BHU401	Industrial Psychology	HSMC-3	3	0	0	20	10	30	70	100	3
6	BMC401-405	Slot for Mandatory Course	MC-2	2	0	0	20	10	30	70	100	0
		PRACTICALS										
7	BECE451	Analog and Digital Communication Lab	PCC-8	0	0	2	10	05	15	35	50	1
8	BECE452	Analog Circuits Lab	PCC-10	0	0	2	10	05	15	35	50	1
9	BECE453	Microcontroller Lab	PCC-12	0	0	2	10	05	15	35	50	1
10	BECE454	Digital Electronics Lab	ESC-9	0	0	4	10	05	15	35	50	2
		TOTAL									**800**	**20**

L- Lecture
T- Tutorial
P- Practical
CT- Cumulative Test
AT - Attendance
CCA- Continuation Comprehensive Assessment
ESE- End Semester Examination

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

STUDY & EVALUATION SCHEME

B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING

YEAR 3RD, SEMESTER-V

S. NO.	COURSE CODE	COURSE TITLE	COURSE TYPE	TEACHING LOAD PER WEEK			MARKS				TOTAL MARKS	CREDIT
							CCA			ESE		
				L	T	P	CT	AT	TOTAL			
		THEORY SUBJECTS										
1	BECE501	Electromagnetic Waves	PCC-13	3	0	0	20	10	30	70	100	3
2	BECE502	Computer Architecture	PCC-15	3	0	0	20	10	30	70	100	3
3	BECE503	Probability Theory and Stochastic Processes	PCC-16	3	0	0	20	10	30	70	100	3
4	BECE504	Digital Signal Processing	PCC-17	3	0	0	20	10	30	70	100	3
5	BECE511-514	Introduction to MEMS	PEC-1	3	0	0	20	10	30	70	100	3
6	BECE001-002	Filter Design	OEC-1	3	0	0	20	10	30	70	100	3
		PRACTICALS										
7	BECE551	Electromagnetic Waves Lab	PCC-14	0	0	2	10	05	15	35	50	1
8	BECE554	Digital Signal Processing Lab	PCC-18	0	0	2	10	05	15	35	50	1
9		**TOTAL**									**700**	**20**

L- Lecture
T- Tutorial
P- Practical
CT- Cumulative Test
AT - Attendance
CCA- Continuation Comprehensive Assessment
ESE- End Semester Examination

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

STUDY & EVALUATION SCHEME

B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING

YEAR 3RD, SEMESTER-VI

S. NO.	COURSE CODE	COURSE TITLE	COURSE TYPE	TEACHING LOAD PER WEEK			MARKS				TOTAL MARKS	CREDIT
							CCA			ESE		
				L	T	P	CT	AT	TOTAL			
	THEORY SUBJECTS											
1	BECE601	Control Systems	PCC-19	3	0	0	20	10	30	70	100	3
2	BCSE602	Computer Network	PCC-20	3	0	0	20	10	30	70	100	3
3	BHU601-632	Slot For HSMC	HSMC-4	3	0	0	20	10	30	70	100	3
4	BECE611-614	Bio-Medical Electronics	PEC-2	3	0	0	20	10	30	70	100	3
5	BECE003-004	Electronic Measurement	OEC-2	3	0	0	20	10	30	70	100	3
	PRACTICALS											
6	BECE651	Electronic Measurement Lab	PCC-22	0	0	2	10	05	15	35	50	1
7	BCSE652	Computer Network Lab	PCC-21	0	0	4	10	05	15	35	50	2
8	BECE653	Electronic Design workshop	PCC-23	0	0	4	20	10	30	70	100	2
		TOTAL									**700**	**20**

L- Lecture
T- Tutorial
P- Practical
CT- Cumulative Test
AT - Attendance
CCA- Continuation Comprehensive Assessment
ESE- End Semester Examination

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

STUDY & EVALUATION SCHEME

B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING

YEAR 4TH, SEMESTER-VII

S. NO.	COURSE CODE	COURSE TITLE	COURSE TYPE	TEACHING LOAD PER WEEK			MARKS				TOTAL MARKS	CREDIT
							CCA			ESE		
				L	T	P	CT	AT	TOTAL			
	THEORY SUBJECTS											
1	BECE711-713	Microwave Theory and Techniques	PEC-3	3	0	0	20	10	30	70	100	3
2	BECE721-722	Fiber Optic Communications	PEC-4	3	0	0	20	10	30	70	100	3
3	BECE731-732	Satellite Communication	PEC-5	3	0	0	20	10	30	70	100	3
4	BECE005-006	Entrepreneurship Development	OEC-3	3	0	0	20	10	30	70	100	3
5	BHU701-732	Slot For HSMC	HSMC-5	3	0	0	20	10	30	70	100	3
	PRACTICALS											
6	BECE751	Project Stage-I	PCC-24	0	0	10	--	--	100	150	250	5
		TOTAL									**750**	**20**

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SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

STUDY & EVALUATION SCHEME

B. TECH. ELECTRONICS & COMMUNICATION ENGINEERING

YEAR 4TH, SEMESTER-VIII

S. NO.	COURSE CODE	COURSE TITLE	COURSE TYPE	TEACHING LOAD PER WEEK		MARKS					TOTAL MARKS	CREDIT
						CCA				ESE		
				L	T	P	CT	AT	TOTAL			
		THEORY SUBJECTS										
1	BECE811-813	Mobile Communication and Networks	PEC-6	3	0	0	20	10	30	70	100	3
2	BECE821-823	Antennas and Propagation	PEC-7	3	0	0	20	10	30	70	100	3
3	BECE007-008	Open Elective (VLSI Circuits)	OEC-4	3	0	0	20	10	30	70	100	3
4	BECE009-010	Open Elective (Digital System Design Using VHDL)	OEC-5	3	0	0	20	10	30	70	100	3
		PRACTICALS										
5	BECE851	Project Stage-II	PCC-25	0	0	18			150	300	450	9
		TOTAL									**850**	**21**

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AT - Attendance
CCA- Continuation Comprehensive Assessment
ESE- End Semester Examination

ELECTRONICS & COMMUNICATION ENGINEERING

Course: B.Tech

COURSE TYPE NOMENCLATURE

Course Code	Definitions
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management Courses
PCC	Program Core Courses
PEC	Program Elective Courses
OEC	Open Elective Courses
MC	Mandatory Courses
CCA	Continuation Comprehensive Assessment
ESE	End Semester Examination

CONTENTS

4		BECE 514 Scientific computing
5		BECE 611 Bio-Medical Electronics
6		BECE 612 CMOS Design
7		BECE 613 Power Electronics
8		BECE 614 Wireless Sensor Networks
9		BECE 711 Microwave Theory and Techniques
10		BECE 712 Digital Image & Video Processing
11		BECE 713 Mixed Signal Design
12		BECE 721 Fiber Optic Communication
13		BECE 722 Embedded Systems
14		BECE 731 Satellite Communication
15		BECE 732 Information Theory and Coding
16		BECE 811 Mobile Communication and Networks
17		BECE 812 Adaptive Signal Processing
18		BECE 813 High Speed Electronics
19		BECE 821 Antennas and Propagation
20		BECE 822 Wavelets
21		BECE 823 Nano electronics

Sl. No.		**Title**
	(iii)	**Basic Science Courses**
1		BAS 101/201 Physics
2		BAS 102/202 Chemistry
3		BAS 103 Mathematics –I
4		BAS 203 Mathematics – II
5		BAS302 Mathematics –III (Differential Calculus)
6		BAS 151/251 Physics Lab
7		BAS 152/252 Chemistry Lab
8		BAS 304/404 Biology
9		BME 301 Engineering Mechanics
	(iv)	**Engineering Science Courses**
1		BEEE 101/201 Electrical Engineering
2		BCSE 101/201 Programming For Problem Solving
3		BEEE 151/251 Electrical Engineering Lab
4		BCSE 151/251 Programming For Problem Solving Lab
5		BME 151/251 Engineering Graphics & Design Lab
6		BME152/252 Workshop Practice Lab
7		BECE305 Basics of Electronics Engineering
8		BECE404 Digital Electronics
9		BECE 454 Digital Electronics Lab
	(v)	**Humanities and Social Sciences Including Management Courses**
1.		BHU 201 Professional English
2.		BHU 251 Professional English Lab
3.		BHU 401 Industrial Psychology
4.		BHU-501/BHU-601/BHU-701 Humanities, Social Science including Management Courses
5.		BHU-502/BHU-602/BHU-702 Foundational Course in Humanities (Development of Societies/

		Philosophy)
6.		BHU-503/BHU-603/BHU-703 Education, Technology and Society
7.		BHU-504/BHU-604/BHU-704 History of Science and Technology in India
8.		BHU-505/BHU-605/BHU-705 Nyaya Logic Epistemology
9.		BHU-506/BHU-606/BHU-706 Political and Economic Thought for a Humane Society
10.		BHU-507/BHU-607/BHU-707 State, Nation Building and Politics in India
11.		BHU-508/BHU-608/BHU-708 Psychological Process
12.		BHU-509/BHU-609/BHU-709 Positive Psychology
13.		BHU-510/BHU-610/BHU-710 Application of Psychology
14.		BHU-511/BHU-611/BHU-711 Sociology, Society and Culture
15.		BHU-512/BHU-612/BHU-712 Epochal Shift
16.		BHU-513/BHU-613/BHU-713 Values and Ethics
17.		BHU-514/BHU-614/BHU-714 Ethics and Holistic Life
18.		BHU-515/BHU-615/BHU-715 Folk and Vernacular Expressive Tradition and Popular Culture
19.		BHU-516/BHU-616/BHU-716 Universal Human Conduct
20.		BHU-517/BHU-617/BHU-717 Gender Culture and Development
21.		BHU-518/BHU-618/BHU-718 Introduction to Women's and Gender Studies
22.		BHU-519/BHU-619/BHU-719 Advance Course in Peace Research
23.		BHU-520/BHU-620/BHU-720 Contemporary India in Globalized Era: Challenges of Democracy and Development
24.		BHU-521/BHU-621/BHU-721 Making Indian Culture: Epistemic Traditions, Literature and Performative Arts
25.		BHU-522/BHU-622/BHU-722 Universal Human Values 2: Understanding Harmony
26.		BHU-523/BHU-623/BHU-723 Human Relations at Work
27.		BHU-524/BHU-624/BHU-724 Sanskrit Bhasa
28.		BHU-525/BHU-625/BHU-725 Language and Communication
29.		BHU-526/BHU-626/BHU-726 Language and Linguistics
30.		BHU-527/BHU-627/BHU-727 Understanding Society and Culture through Literature
31.		BHU-528/BHU-628/BHU-728 Fundamentals of Linguistics
32.		BHU-529/BHU-629/BHU-729 Elements of Literature
33.		BHU-530/BHU-630/BHU-730 Humanities and Multiple Dimensions of Ecology

34.		BHU-531/BHU-631/BHU-731 Film Appreciation
35.		BHU-532/BHU-632/BHU-732 Law and Engineering
	(vi)	**Open Elective Courses**
1		BECE 001 Image Processing
2		BECE 002 Filter Design
3		BECE 003 Electronics Measurement
4		BECE 004 Introduction to RADAR Systems
5		BECE005 Entrepreneurship Development
6		BECE006 Non Conventional Energy Resources
7		BECE 007 VLSI Circuits
8		BECE 008 Automation and Robotics
9		BECE 009 Digital System Design Using VHDL
10		BECE 010 Non-Linear Dynamic Systems

MANDATORY COURSES:

1. BMC – 301/401/501 - Constitution of India
2. BMC- 302/402 Universal Human Values- I (During Induction program)
3. BMC- 303/403 Environment Science
4. BMC- 304/404 Essence of Indian Knowledge Tradition
5. BMC- 305/405 Learning an art form (During induction program)

Department Of Electronics & Communication Engineering

1- Subject Code: BAS-101/201 Course Title: PHYSICS
2- Contact Hours: L: 3 T: 1 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 4

OBJECTIVES:

1. To understand the general scientific concepts of Relativistic Mechanics
2. To apply the physics concepts in solving engineering problems.
3. To educate scientifically the new developments in engineering and technology
4. To emphasize the significance of Fibre Optics & Laser.

Unit No.	Particulars	Contact Hours
1	**RelativisticMechanics:** Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Mass less particle.	8
2	**Electromagnetic Field Theory:** Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth	8
3	**Quantum Mechanics:** Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.	8
4	**Wave Optics:** Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.	10
5	**Fibre Optics & Laser:** Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres. Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.	10

OUTCOMES:

Upon completion of this course, students will be able to:

1. To solve the classical and wave mechanics problems.
2. To develop the understanding of laws of thermodynamics and their application in various processes.
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory.
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams.

Reference Books:

1. Concepts of Modern Physics – Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics – Brijlal & Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

Department Of Electronics & Communication Engineering

1- Subject Code: BAS-102/202 Course Title: CHEMISTRY
2- Contact Hours: L: 3 T: 1 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 4

OBJECTIVES:

1. To understand the basic concept of Atomic and Molecular Structure.
2. To understand the basic concept Nanomaterials.
3. To understand the basic concept of Water Analysis**.**
4. To understand the basic concepts of polymer-Blend and composites.

Unit No.	Particulars	Contact Hours
1	**Atomic and Molecular Structure:** Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application	8
2	**Spectroscopic techniques and Applications:** Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.	8
3	**Electrochemistry:** Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and Δ S). Lead storage battery. **Corrosion**; causes, effects and its prevention. **Phase Rule** and its application to water system	8
4	**Water Analysis:** Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method). **Fuels:** classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeter and Dulong's methods)..	8
5.	**Polymer:** Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications	8

Course Outcomes

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao

3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry ByFre W., Billmeyer
7. Engineering ChemistryBy Satya Prakash

Department Of Electronics & Communication Engineering

1- Subject Code: BAS-103 Course Title: MATHEMATICS-1
2- Contact Hours: L: 3 T: 1 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 4

OBJECTIVES:

1. To apply advanced matrix knowledge to Engineering problems.
2. To equip themselves familiar with the functions of several variables.
3. To familiarize with the applications of differential equations.
4. To improve their ability in solving geometrical applications of differential calculus problems.

Unit No.	Particulars	Contact Hours
1	**Matrices:** Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix.	12
2	**Differential Calculus- I :** Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (nth order derivatives), Leibnitz theorem and its application, Envelope, Involutes and Evolutes, Curve tracing: Cartesian and Polar co-ordinates.	10
3	**Differential Calculus-II :** Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.	8
4	**Multivariable Calculus-I :** **Multiple integration:** Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities).	10
5	**Vector Calculus:** Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives, Tangent and Normal planes. Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem, Stoke's theorem (without proof) and their applications	

COURSE OUTCOMES

1. Remember the concept of matrices and apply for solving linear simultaneous equations.
2. Understand the concept of limit, continuity and differentiability and apply in the study of Rolle's , Lagrange's and Cauchy mean value theorem and Leibnitz theorems .
3. Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
4. Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
5. Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books-

1.E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2.Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3.Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4.D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
6.Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.
7. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd
8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.
9. Engineering Mathemathics – I. Reena Garg, 2018.

Department Of Electronics & Communication Engineering

1- Subject Code: BEEE-101/201 Course Title: ELECTRICAL ENGINEERING
2- Contact Hours: L: 3 T: 1 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 4

OBJECTIVES:

1. Understand the basic concepts of magnetic circuits, AC & DC circuits.
2. Explain the working principle, construction, applications of DC & AC machines and measuring instruments.
3. Gain knowledge about the fundamentals of wiring and earthing

Unit No.	Particulars	Contact Hours
1	DC Circuits : Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff"s laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem	8
2	Steady- State Analysis of Single Phase AC Circuits Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor. Three phase balanced circuits, voltage and current relations in star and delta connections..	10
3	Transformers Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.	8
4	Electrical machines **DC machines:** Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems). **Three Phase Induction Motor:** Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only). **Single Phase Induction motor:** Principle of operation and introduction to methods of starting, applications. **Three Phase Synchronous Machines:** Principle of operation of alternator and synchronous motor and their applications.	8
5	Electrical Installations Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB,	6

	MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup	

Course Outcomes:

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behaviour of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.
2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.
4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.
3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India

Department Of Electronics & Communication Engineering

1- Subject Code: BCSE-101/201 Course Title: PROGRAMMING FOR PROBLEM SOLVING
2- Contact Hours: L: 0 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 4

OBJECTIVES:
To learn the different types of programming and solving techniques.

Unit No.	Particulars	Contact Hours
1	**Introduction to Programming:** **Introduction to components of a computer system:** Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker. **Idea of Algorithm:** Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code. **Programming Basics:** Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.	8
2	**Arithmetic expressions & Conditional Branching:** **Arithmetic expressions and precedence:** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively. **Conditional Branching:** Applying if and switch statements, nesting if and else, use of break and default with switch.	8
3	**Loops & Functions:** **Iteration and loops:** use of while, do while and for loops, multiple loop variables, use of break and continue statements. **Functions:** Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions	8
4	**Arrays & Basic Algorithms:** **Arrays:** Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, passing arrays to functions. **Basic Algorithms:** Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity	8
5	**Pointer& File Handling:** **Pointers:** Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation) **File handling:** File I/O functions, Standard C pre-processors, defining and calling macros, command-line arguments.	8

Outcomes:

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Department Of Electronics & Communication Engineering

1- Subject Code: BAS-151/251 Course Title: PHYSICS LAB
2- Contact Hours: L: 0 T: 0 P: 3
3- Examination Duration (Hrs.): Theory 03
4- Credits: 1.5

OBJECTIVES:

1. Demonstrate an ability to make physical measurements and understand the limits of precision in measurements
2. Demonstrate the ability to use experimental statistics to determine the precision of a series of measurements
3. Demonstrate the ability to measure properties of a variety of electrical and optical systems.
4. Demonstrate the ability to prepare a valid laboratory notebook
5. Demonstrate the ability to craft a well-written laboratory report (template provided).
6. Demonstrate the ability to construct a variety of working electrical circuits.

List of Experiments:

Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

Course Outcomes:

1. To determine the wavelength of sodium light by Newton‟s ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel‟s bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

Text books/ Reference books:

As per recommendation of concern instructor/ supervisor.

Department Of Electronics & Communication Engineering

1- Subject Code: BAS-152/252 Course Title: CHEMISTRY LAB
2- Contact Hours: L: 0 T: 0 P: 3
3- Examination Duration (Hrs.): Theory 03
4- Credits: 1.5

OBJECTIVES:

The course intends to provide an overview of the working principles and mechanism of reactions.
This course relies on elementary treatment and qualitative analysis and makes use of simple models and equation to illustrate the concepts involved.
To provide an overview of preparation and identification of organic compounds.
To gain the knowledge on existing future upcoming devices, materials and methodology.

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

Text books/ Reference books: As per recommendation of concern instructor/ supervisor.

Department Of Electronics & Communication Engineering

1- Subject Code: BEEE-151/251 Course Title: ELECTRICAL ENGINEERING LAB
2- Contact Hours: L: 0 T: 0 P: 2
3- Examination Duration (Hrs.): Theory 03
4- Credits: 1

OBJECTIVES:

1. An understanding of basic electrical wiring, measurements, and methods
2. Students understand measurement errors and non-ideal electrical devices
3. Students demonstrate effective written communication skills
4. **LIST OF EXPERIMENTS**

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws.
2. Verification of Superposition and Thevenin's Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor.
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit .
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer.
10. Determination of efficiency of a dc shunt motor by load test.
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behaviour of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction

Text books/ Reference books:

As per recommendation of concern instructor/ supervisor.

Department Of Electronics & Communication Engineering

1- Subject Code: BCSE-151/251 Course Title: Programming for Problem Solving Lab
2- Contact Hours: L: 0 T: 0 P: 2
3- Examination Duration (Hrs.): Theory 03
4- Credits: 1

OBJECTIVES:
Understanding the basic about the programming languages.

List of Programs:-

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5= (F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%----------Print 'A'
80-90%----------Print 'B'
60-80%----------Print 'C'
Below 60%----------Print 'D'
11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23. WAP to find the minimum and maximum element of the array.
24. WAP to search an element in a array using Linear Search.
25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.
26. WAP to add and multiply two matrices of order nxn.
27. WAP that finds the sum of diagonal elements of a mxn matrix.
28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:
(i) List all the trains (sorted according to train number) that depart from a particular section.
(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. Write programs using arrays, pointers and structures.

Department Of Electronics & Communication Engineering

1- Subject Code: BME-151/251 Course Title: Engineering Graphics & Design
2- Contact Hours: L: 1 T: 0 P: 4
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

OBJECTIVES:
In this course, mainly it is aimed to provide students with the writing and reading principles of "Engineering Drawing", which is a graphical universal language used in technical world for describing the shape and size of an object via supplying orthographic views and/ or solid models associated with all the necessary dimensions, associated tolerances and annotations created in a CADD environment.

[A total of 10 lecture hours & 60 hours of lab.]

Detailed contents

Traditional Engineering Graphics:

Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

Computer Graphics:

Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

Experiment No.	Experiment name	Experiment Hours
1	**Introduction to Engineering Drawing, Orthographic Projections** Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales. Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.	8
2	**Projections and Sections of Regular Solids** Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc. Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone	8
3	**Isometric Projections** Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions	8
4	**Computer Graphics** Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars	8

	(Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids]; Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles: Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:	
5	**Demonstration of a simple team design project** Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling	8

	(BIM).	

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

Department Of Electronics & Communication Engineering

1- Subject Code: BME-152/252 Course Title: WORKSHOP PRACTICE LAB
2- Contact Hours: L: 1 T: 0 P: 4
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

LIST OF EXPERIMENTS

Machine shop:

1. Study of machine tools in particular Lathe machine
2. Demonstration of different operations on Lathe machine
3. Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
4. Study of Quick return mechanism of Shaper.

Fitting shop:

1. Preparation of T-Shape Work piece as per the given specifications.
2. Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
3. Practice marking operations.

Carpentry:

1. Study of Carpentry Tools, Equipment and different joints.
2. Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

1. Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
2. Soldering and desoldering of Resistor in PCB.
3. Soldering and desoldering of IC in PCB.
4. Soldering and desoldering of Capacitor in PCB

Welding:

1. Instruction of BI standards and reading of welding drawings.
2. Butt Joint
3. Lap Joint
4. TIG Welding
5. MIG Welding

Casting:

1 . Introduction to casting processes

Smithy

1. Sharpening any arc and edge.
2. Preparing small arc and edge,
3. Repair of agricultural implements and power plough, use of power hammer etc

Plastic Moulding& Glass Cutting

1. Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes.
2. Demo of mould preparation.
3. Practice – Preparation of mould.

4. Glass cutting.

COURSE OUTCOMES

1. Study and practice on machine tools and their operations.
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping.
4. Welding and soldering operations.
5. Apply basic electrical engineering knowledge for house wiring practice.

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008

Department Of Electronics & Communication Engineering

1- Subject Code: BHU-251 Course Title: ENGLISH LAB
2- Contact Hours: L: 0 T: 0 P: 2
3- Examination Duration (Hrs.): Theory 03
4- Credits: 0

OBJECTIVES :

1. To enable students improve their lexical, grammatical and communicative competence.
2. To enhance their communicative skills in real life situations.
3 To assist students understand the role of thinking in all forms of communication.
4. To equip students with oral and appropriate written communication skills.
5. To assist students with employability and job search skills.

List of Experiments:

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics /Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme- Presentation/Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practical on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman, New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P. Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

Course Outcomes:

1. Acquire knowledge about the various principles of communication, understand its various stages and the role of audience and purpose, deal with the barriers that affect communication in a professional set up.
2. Understand the different channels that are functional at the work place.
3. Learn the importance of verbal and non-verbal communication in the professional world along with its uses.
4. Learning the uses and application of RP to improve pronunciation.
5. Understanding the importance of intonation, word and sentence stress for improving communicative competence, identifying and overcoming problem sounds.

Department Of Electronics & Communication Engineering

1- Subject Code: BAS-203 Course Title: MATHEMATICS-II
2- Contact Hours: L: 3 T: 1 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 4

OBJECTIVES:

To introduce students the theory and concepts of differential equations, linear algebra, Laplace transformations and Fourier series which will equip them with adequate knowledge of mathematics to formulate and solve problems analytically.

Experiment No.	Experiment name	Experiment Hours
1	**Ordinary Differential Equation of Higher Order:** Linear differential equation of nth order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation, Series solutions (Frobenius Method)	10
2	**Multivariable Calculus-II** Improper integrals, Beta & Gama function and their properties, Dirichlet's integral and its applications, Application of definite integrals to evaluate surface areas and volume of revolutions.	8
3	**Sequences and Series:** Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series, (Ratio test, D' Alembert's test, Raabe's test). Fourier series, Half range Fourier sine and cosine series.	8
4	**Complex Variable – Differentiation:** Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping, Mobius transformation and their properties .	8
5	**Complex Variable –Integration:** Complex integrals, Contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$ . .	8

1. **Outcomes**

1. Understand the concept of differentiation and apply for solving differential equations.
2. Remember the concept of definite integral and apply for evaluating surface areas and volumes.
3. Understand the concept of convergence of sequence and series. Also evaluate Fourier series
4. Illustrate the working methods of complex functions and apply for finding analytic functions.
5. Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing -House, 2002.

Reference Books:-

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8th Edition-Tata McGraw-Hill
6. D. Poole , Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
8. Charles E Roberts Jr, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
9. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6th Edition, Tata McGraw-Hill.
10. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, Tata McGraw-Hill.
11. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd.
12. Advanced Engineering Mathematics By Chandrika Prasad, Reena Garg Khanna Publishing House, Delhi

Department Of Electronics & Communication Engineering

1- Subject Code: BHU-201 Course Title: PROFESSIONAL ENGLISH
2- Contact Hours: L: 2 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

OBJECTIVES :
1. To enable students improve their lexical, grammatical and communicative competence.
2. To enhance their communicative skills in real life situations.
3 To assist students understand the role of thinking in all forms of communication.
4. To equip students with oral and appropriate written communication skills.
5. To assist students with employability and job search skills.

Experiment No.	Experiment name	Experiment Hours
1	**Basics of Technical English** Technical English: Definition; Extent& Coverage; Dimensions; Reading; Skimming; Scanning; Churning & Assimilation; Writing: Methods: Inductive; Deductive; Exposition; Linear; Interrupted; Spatial & Chronological etc; Technical Communication; Approaches: Brevity; Objectivity; Simplicity; Utility & Clarity. **Listening**: Active; Passive; Thinking strategies: Positive & Logical thinking; Speaking: Essentials Nuances & Modes of Speech Delivery.	8
2	**Components of Technical Writing** Vocabulary Building: Select words; Concept of word formation; Word formation; Root words from foreign languages & their use in English; Prefixes & Suffixes: Derivatives; Synonyms; Antonyms; Abbreviations. Homophones. One word substitutes; Requisites of Sentences.	8
3	**Basic Technical Writing Skills** Forms: Business writing: Principle; Purchase & Sales Letters; Drafts; Official Writing: Official Letter; D.O. Letter; Notices; Agenda; Minutes of Meeting; Sentence Structure; Phrases & Clauses in sentences; Coherence; Unity; Emphasis in Writing; Devices; Use of Writing methods in Documents; Techniques of writing.	8
4	**Common Grammatical Errors & Technical Style** Subject-verb agreement; Correct usage: Noun; Pronoun; Agreement; Modifiers; Articles; Prepositions; Cliches; Redundancies; Technical Style: Features; Choice of words; Sentences: Descriptive; Narrative; Expository; Defining & Classifying; Length of paragraph; Writing of Introduction & Conclusion	8
5	Analysis of locale; Audience; Modulating Style & Content; Speaking with confidence; Kinesics; Paralinguistic features of Voice-Dynamics: Pitch; Intonation; Stress & Rhythm; Conversation & dialogues; Communication at work-place; etc.	8

COURSE OUTCOMES:

1. Students will be enabled to **understand** the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.
2. Students would be able to **create** substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
3. Students will **apply** it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.
4. Students will be made to **evaluate** the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.
5. Students will **apply** it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.

Text Books:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.

Reference Books:

1. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors, 2009, Delhi.
2. Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
3. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
4. English Grammar, Composition and Usage by N.K.Agrawal&F.T.Wood, Macmillan India Ltd., New Delhi.
5. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
6. English Grammar & Composition by Wren & Martin, S.Chand& Co. Ltd., New Delhi.
7. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
8. Personality Development, Harold R. Wallace &L.Ann Masters, Cengage Learning, New Delhi.
9. Personality Development & Soft Skills, BarunK.Mitra, Oxford University Press, 2012 New Delhi.
10. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
11. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

12. Spoken English- A manual of Speech and Phonetics by R.K.Bansal&J.B.Harrison, Orient Blackswan, 2013, New Delhi.
13. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi

1- Subject Code: BECE-301 Course Title: Electronic Devices
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:

The course intends to provide an overview of the principles, operation and application of the analog building blocks like diodes, BJT, FET etc for performing various functions.
This course relies on elementary treatment and qualitative analysis and makes use of simple models and equation to illustrate the concepts involved.
To provide an overview of amplifiers, feedback amplifiers and oscillators.
To gain the knowledge on existing on future analog circuits.

Unit No.	Particulars	Contact Hours
1	Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors.	8
2	Generation and BECEombination of carriers; Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode.	8
3	Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model,MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell.	7
4	Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.	9

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

1. Understand the principles of semiconductor Physics
2. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems

Text /Reference Books:

1. G. Streetman, and S. K. Banerjee, “Solid State Electronic Devices,” 7th edition, Pearson,2014.
2. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, “Physics of Semiconductor Devices,” 3rd edition, John Wiley &Sons, 2006.
4. C.T. Sah, “Fundamentals of solid state electronics,” World Scientific Publishing Co. Inc, 1991.
5. Y. Tsividis and M. Colin, “Operation and Modeling of the MOS Transistor,” Oxford Univ.Press, 2011.
6. S.Y. Liao, “Microwave circuit Analysis and Amplifier Design”, Prentice Hall 1987. Radmanesh, “RF and Microwave Electronics Illustrated” , Pearson Education, 2004.

1- Subject Code: BECE-302 Course Title: Digital System Design
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

1. To introduce the concepts and techniques associated with the number systems and codes. To minimize the logical expressions using Boolean postulates.
2. To design various combinational and sequential circuits.
3. To provide with an appreciation of applications for the techniques and mathematics used in this

course

Unit No.	Particulars	Contact Hours
1	Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan'sTheorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, CodeConversion.	6
2	MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half andFull Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU	6
3	Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Rippleand Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM,Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, PseudoRandom Binary Sequence generator, Clock generation	7
4	Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Conceptof Programmable logic devices like FPGA. Logic implementation using Programmable Devices	7
5	VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data typesand objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits	6

Course Outcomes:

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

1. Design and analyze combinational logic circuits
2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder.
3. Design & analyze synchronous sequential logic circuits
4. Use HDL & appropriate EDA tools for digital logic design and simulation

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition ,2006.
4. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-303 Course Title: Signals and Systems
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

To introduce the concepts and techniques associated with the signals and systems. To minimize the logical complexity using various system responses.

Unit No.	Particulars	Contact Hours
1	Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional/multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their interrelationships), exponential, Rectangular pulse, sinusoidal; operations on Continuous-time and discrete-time signals (including transformations of independent variables).	8
2	Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.	8
3	Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.	7
4	The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.	9
5	State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.	9

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Analyze different types of signals
2. Represent continuous and discrete systems in time and frequency domain using different transforms
3. Investigate whether the system is stable
4. Sampling and Reconstruction of a signal

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
1. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
2. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.

3. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
4. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
5. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, c1998.
6. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
7. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.
8. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.
9. Ashok Ambardar,"Analog and Digital Signal Processing", 2nd Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company), 1999.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-304 Course Title: Network Theory
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

1. Understand the fundamental concepts and theories about networks.
2. Apply this knowledge to solve real-world, network-centric problems.
3. Use advanced network analysis methods and tools to visualize and analyze networks.
4. Interpret the results with respect to exploratory, quantitative and substantive questions.

Unit No.	Particulars	Contact Hours
1	Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality. Network theorems: Superposition, Reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits.	8
2	Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.	8
3	Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.	7
4	Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two four port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.	9

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.

Text/Reference Books

1. Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi, 1994
3. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-305 Course Title: Basics of Electronics Engineering
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

1. To acquire a strong background in basic science and mathematics and ability to use these tools in electronics and communication engineering.
2. To attain professional excellence through life-long learning.
3. To attain the qualities of professional leadership to deliver effectively in a multi-disciplinary team and domains

Unit No.	Particulars	Contact Hours
1	Semiconductors p-type, n-type, pn junction diodes, pn junction as a circuit element, its characteristics, half wave and full wave and bridge type Rectifier circuits basic filter circuits, Diode as voltage multiplier, clipper & clamper circuit. Zener diode as a voltage regulator. LED its characteristics construction & applications.	8
2	Characteristics of transistors in different configuration. Concept of d.c. and a.c. load line and operating point selection. Various amplifiers configurations their h-parameter equivalent circuits determination of voltage gain current gain input resistance and output resistance & power gain. Concept of feedback in amplifiers, different oscillators circuits (without analysis).	8
3	Differential amplifier and its transfer characteristics. IC Op-Amps, its ideal & practical specifications and measurement of parameters. Op-Amp in different modes as inverting amplifier non inverting amplifier scale changer, differentiator & integrator.	7
4	Characteristics of JFET, MOSFET, Various amplifier configurations using FET. Characteristics and Construction of SCR, TRIAC, UJT and basic areas of applications	7

Course Outcomes:

- Students should be able to solve problems through analytical thinking.
- Students should develop skills to solve problems in electronics and communication engineering using mathematical techniques and scientific knowledge.
- Students should be able to employ necessary techniques, hardware and software tools for engineering applications.
- Students should be able to synthesize solutions for existing problems within practical constraints.

Text/ Reference Books

- Electronic Devices & Circuits - Boylstad & Nashelsky.
- Integrated Electronics By Millman & Halkias.
- Electronic Principles – Malvino
- Principles of Electronics – V.K. Mehta, Shalu Melta.
- Electronic Circuits – Donald L. Shilling & Charles Belowl

Department Of Electronics & Communication Engineering

1- Subject Code: BAS-302 Course Title: Mathematics-III
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
- To introduce effective mathematical tools for the solutions of differential equations that model physical processes.
- To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems

Unit No.	Particulars	Contact Hours
1	***Partial Differential Equations – First order*** -First order partial differential equations, solutions of first order linear and non-linear PDEs.	8
2	***Partial Differential Equations*** – **Higher order-** Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method	8
3	**Integral Transforms:** Laplace transform, Inverse Transforms, Convolution Theorems, Applications of Laplace transform to ordinary differential equation. Z- transform and its application to solve difference equations.	9
4	**Numerical Techniques – I** Zeroes of transcendental and polynomial equations using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods. **Interpolation:** Finite differences, Newton's forward and backward interpolation, Lagrange's and Newton's divided difference formula for unequal intervals**.**	8
5	**Numerical Techniques –II** Solution of system of linear equations, Matrix Decomposition methods, Jacobi method, Gauss- Seidal method. Numerical differentiation, Numerical integration, Trapezoidal rule, Simpson's one third and three-eight rules, Solution of ordinary differential equations (first order,second order and simultaneous) by Euler's, Picard's and fourth-order Runge- Kutta methods.	8

Course Outcomes:

- Ability to know and understand various Mathematical Function, Laplace Transform.
- Analyze boundary value problem related to Laplace Transform
- Ability to Numerical Techniques.

Text/Reference Books

- Higher Engg. Mathematics : B.S. Grewal
- Advanced Engg. Mathematics : E. Kreyzig
- Complex variables and Applications : R.V. Churchil; Mc. Graw Hill
- Engg. Mathematics Vol. II: S.S. Sastry; Prentice Hall of India.
- Operation Research : H.A. Taha
- Probability and statistics for Engineer : Johnson. PHI

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-351 Course Title: Electronic Devices Lab
2- Contact Hours: L: 0 T: 0 P: 2
3- Examination Duration (Hrs.): Lab 02
4- Credits: 3

LIST OF EXPERIMENTS

- Measurement & study of P-N junction diode-I-V and C-V characteristics.
- Study of Half-wave and Full-wave Rectifier.
- Measurement and study of solar cell –I-V characteristics.
- Study of Active filters.
- Study of diode as Clipper and Clamper.
- Study of Zener diode as Voltage Regulator.
- Measurement and study of Input and Output characteristics of a BJT.
- Study of CE amplifier-Current & Power gains and Input, Output Impedances.
- To study the frequency response of RC coupled amplifier.
- Measurement and study of Output characteristics of JFET.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-352 Course Title: Digital System Design Lab
2- Contact Hours: L: 0 T: 0 P: 2
3- Examination Duration (Hrs.): Lab 02
4- Credits: 3

LIST OF EXPERIMENTS

- Familiarization with Digital Trainer Kit and associated equipment.
- Study of TTL gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
- Design and realize a given function using K-Maps and verify its performance.
- To verify the operation of Multiplexer and Demultiplexer.
- To verify the operation of Comparator.
- To verify the truth table of S-R, J-K, T, D Flip-flops.
- To verify the operation of Bi-directional shift register.
- To design and verify the operation of 3-bit asynchronous counter.
- To design and verify the operation of synchronous Up/down counter using J-K flip flops & drive a seven-segment display using the same
- To design and verify the operation of asynchronous Decade counter.
- Study of TTL logic family characteristics.
- Study of Encoder and Decoder.
- Study of BCD to 7 segment Decoder.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-401 Course Title: Analog and Digital Communication
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

1. To understand modulation, demodulation and design of major building blocks of Communication system.
2. To understand the communication systems, Signal modulation techniques will be emphasized.
3. Modulation techniques will be analyzed both in time and frequency domains.
4. Transmission techniques (base band, band pass) will be emphasized.
5. To develop a clear insight into the relations between the input and output ac signals in various stages of a transmitter and a Receiver of AM & FM systems.

Unit No.	Particulars	Contact Hours
1	Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.	12
2	Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.	12
3	Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation (PCM),Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers.	10
4	Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Base band Pulse Transmission- Inter symbol Interference and Nyquist criterion. Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.	10
5	Digital Modulation tradeoffs. Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi Receiver). Equalization Techniques. Synchronization and Carrier Recovery for Digital modulation.	10

COURSE OUTCOMES:

1. At the end of this course students will demonstrate the ability to
2. Analyze and compare different analog modulation schemes for their efficiency and bandwidth
3. Analyze the behavior of a communication system in presence of noise
4. Investigate pulsed modulation system and analyze their system performance
5. Analyze different digital modulation schemes and can compute the bit error performance

TEXT/REFERENCE BOOKS:

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.
4. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.

Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-402 Course Title: Analog circuits
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

1. To understand the basic concepts of circuit analysis.
2. To understand Single Phase A.C Circuits
3. To understand Resonance concept
4. To understand magnetic circuits
5. Circuit theorems.
6. Networks topology.

Unit No.	Particulars	Contact Hours
1	Diode Circuits, Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.	12
2	High frequency transistor models, frequency response of single stage and multistage amplifiers, cascade amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.	12
3	Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators(phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators. Current mirror: Basic topology and its variants, V-I characteristics, outputresistance and minimum sustainable voltage (VON), maximum usable load. Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages, compensation.	10
4	OP-AMP applications: review of inverting and non-inverting amplifiers, integratorand differentiator, summing amplifier, precision Rectifier, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop, design guidelines.	10
5	Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistorstring etc. Analog-to-digital converters (ADC): Single slope, dual slope, successive approximation, flash etc. Switched capacitor circuits: Basic concept, practical configurations, application in amplifier, integrator, ADC etc.	10

COURSE OUTCOMES:

1. At the end of this course students will demonstrate the ability to
2. Understand the characteristics of diodes and transistors

3. Design and analyze various Rectifier and amplifier circuits
4. Design sinusoidal and non-sinusoidal oscillators
5. Understand the functioning of OP-AMP and design OP-AMP based circuits
   Design ADC and DAC

TEXT/REFERENCE BOOKS:

1. J.V. Wait, L.P. Huelsman and GA Korn, Introduction to Operational Amplifier theory and applications, McGraw Hill, 1992.
2. J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.
4. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College11
   Publishing, Edition IV

Paul R. Gray and Robert G.Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rd Edition.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-403 Course Title: Microcontrollers
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

Understand need of microprocessors, microcontrollers in development of various projects and to know complete architectural, programming, interfacing details of 8086 microprocessor-8051 microcontroller.

Unit No.	Particulars	Contact Hours
1	Overview of microcomputer systems and their building blocks, memory interfacing, concepts of interrupts and Direct Memory Access, instruction sets of microprocessors (with examples of 8085 and 8086).	12
2	Interfacing with peripherals - timer, serial I/O, parallel I/O, A/D and D/A converters; Arithmetic Coprocessors; System level interfacing design.	12
3	Concepts of virtual memory, Cache memory, Advanced coprocessor Architectures- 286, 486, Pentium; Microcontrollers: 8051 systems,	10
4	Introduction to RISC processors; ARM microcontrollers interface designs.	10

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to
Do assembly language programming

Do interfacing design of peripherals like, I/O, A/D, D/A, timer etc.
Develop systems using different microcontrollers

Understand RSIC processors and design ARM microcontroller based systems

TEXT/REFERENCE BOOKS:

R. S. Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing, 1996 D A Patterson and J H Hennessy, "Computer Organization and Design The hardware and software interface. Morgan Kaufman Publishers.
Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill, 1991.

Kenneth J. Ayala, The 8051 Microcontroller, Penram International Publishing, 1996.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-404 Course Title: Digital Electronics
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

1. To introduce the concepts and techniques associated with the number systems and codes. To minimize the logical expressions using Boolean postulates.
2. To design various combinational and sequential circuits.
3. To provide with an appreciation of applications for the techniques and mathematics used in this course.

Unit No.	Particulars	Contact Hours
1	Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes,characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-statelogic.	12
2	Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder,serialadder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices,Q-M method of functionrealization	12
3	A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop,J-K-TAndtypesflipflops,applicationsofflipflops,shiftregisters,applicationsofshiftregisters,serialtoparallel converter,parallel to serial converter,ring counter, sequence generator, ripple(Asynchronous) counters, synchronous counters, counters design using flip flops,special counter IC's, asynchronous sequential counters, applications of counters.	10
4	Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope	10
5	Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).	

COURSEOUTCOMES:

1. At the end of this course, students will demonstrate the ability to
2. Understand working of logic families and logic gates.
3. Design and implement Combinational and Sequential logic circuits.
4. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
5. Be able to use PLDs to implement the given logical problem.

TEXT/REFERENCES:

4. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
5. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
6. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

Department Of Electronics & Communication Engineering

1- Subject Code: BHU-401 Course Title: Industrial Psychology
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

1. Selection of proper person for proper work.
2. Proper distribution of work
3. Minimizing the wastage of human force
4. Promoting labor welfare

Unit No.	Particulars	Contact Hours
1	Introduction to Industrial Psychology – Definitions & Scope**.** Major influences on Industrial Psychology- Scientific Management and Human relations -Hawthorne Experiments. Implications of Industrial Psychology on Modern Industries	12
2	**Individual in Workplace** Motivation and Job satisfaction. Stress management. Organizational culture, Leadership and Group dynamics	12
3	Work Environment & Engineering Psychology-fatigue, Monotony, and Boredom. Accidents and Safety	08
4	Job Analysis, Recruitment, Selection and Interview– Reliability & Validity of Recruitment tests.	08
5	Performance Management: Training & Development.	04

COURSEOUTCOMES:

1. Industrial Psychology is to study the human behaviour and to suggest various ways and means lo improve the efficiency of workers in industries.
2. By the use of systematic depth interviews and psychological tests such as intelligence, aptitude, skills, abilities and interest tests, the personnel characteristics of the persons are measured
3. The proper distribution of work, according to the ability and aptitude of the employees so that they feel themselves satisfied and the employer may also get higher production at minimum cost.
4. Job satisfaction, increase in labour efficiency, health and incentive provisions.

TEXT/REFERENCES:

1. Miner J.B. (1992) Industrial/Organizational Psychology. N Y : McGraw Hill.
2. Blum & Naylor (1982) Industrial Psychology. Its Theoretical & Social Foundations CBS Publication.
3. Aamodt, M.G. (2007) Industrial/Organizational Psychology : An Applied Approach (5th edition) Wadsworth/Thompson : Belmont, C.A.
4. Aswathappa K. (2008). Human Resource Management (fifth edition) New Delhi : Tata McGraw Hill.
5. Bisen Vikram & Priya (2008), Industrial Psychology (third edition), New Age International *Publishers*, New Delhi.

Department Of Electronics & Communication Engineering

1-Subject Code: BMC-401 Course Title: Constitution of India
2-Contact Hours: L: 3 T: 0 P: 0
3-Examination Duration (Hrs.): Theory 03
4-Credits: 3

Objectives:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

Unit No.	Particulars	Contact Hours
1	**History of Making of the Constitution:Indian** History Drafting Committee, (Composition & Working), Preamble, The Union and its territory, Citizenship	4
2	**Contours of Constitutional Rights & Duties:** Fundamental Rights Right to Equality Right to Freedom Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights Right to Constitutional Remedies Directive Principles of State Policy Fundamental Duties	4
3	**Organs of Governance:** Parliament Composition Qualifications and Disqualifications Powers and Functions Executive President Governor Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions	4
4	**Sate Legislation:** Function and formation of state legislative, legislative council, Power of chief minister, union state relationship **Local Administration:** District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO o Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	4
5	**Commission:** Election Commission: Role and Functioning.	4

	Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.	

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956

References:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-451 Course Title: Analog and Digital Communication Lab
2- Contact Hours: L: 0 T: 0 P: 2
3- Examination Duration (Hrs.): Lab 02
4- Credits: 3

Objectives:

- To understand modulation, demodulation techniques used in communication system, and develop the Modulation techniques used in both time and frequency domains.
- To develop a knowledge pre-emphasis and de-emphasis circuits used in the analog communication.
- To analyze the Signal Modulation (amplitude, frequency, and phase) and transmission techniques (base band, SSB system) will be emphasized.
- To understand the concept of mixer, PLL, Digital phase detector and synchronous detector to develop a clear insight into the relations between the input and output ac signals in various stages of a transmitter and a Receiver of AM & FM systems.

EXPERIMENTS

1 To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2 To study amplitude demodulation by linear diode detector
3 To study frequency modulation and determine its modulation factor
4 To study PLL 565 as frequency demodulator.
5 To study sampling and Reconstruction of Pulse Amplitude modulation system.
6 To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne Receiver.
7 To study Pulse Amplitude Modulation
  a. using switching method
  b. by sample and hold circuit
8 To demodulate the obtained PAM signal by 2nd order LPF.
9 To study Pulse Width Modulation and Pulse Position Modulation.
10 Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
11 Study of Phase shift keying modulator and demodulator
12 Design and implement an FM radio Receiver in 88-108 MHz.
13 Study of single bit error detection and correction using Hamming code.

COURSE OUTCOMES

- Should be able to explain modulation and demodulation technique techniques in various communications.
- Should be able to understand the operations of different types of detectors.
- Should be able to analyze the signal transmission and Receiving fundamental concepts.
- Should be able to describe the operation of Multiplexing techniques.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-452 Course Title: Analog Circuits Lab
2- Contact Hours: L: 0 T: 0 P: 2
3- Examination Duration (Hrs.): Lab 02
4- Credits: 3

OBJECTIVES:

- The course intends to provide an overview of the principles, operation and application of the analog building blocks like diodes, BJT, FET etc for performing various functions.
- This course relies on elementary treatment and qualitative analysis and makes use of simple models and equation to illustrate the concepts involved.
- To provide an overview of amplifiers, feedback amplifiers and oscillators.
- To gain the knowledge on existing on future analog circuits.

EXPERIMENTS

The project may include but not restricted to any of the following:
1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include:
1. Design the circuit.
2. Make hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.
5. A report is to be made for evaluation.

COURCE OUTCOMES

- Understand the operating principles of major electronic devices, circuit models and connection to the physical operation of the devices..
- Able to apply this knowledge to the analysis and design of basic circuits.
- An ability to design and conduct experiments, as well as to organize, analyzes, and interprets data.
- An ability to identify, formulates, and solves hardware engineering problems.
- The following are the major outcomes in the part of electronic circuits and analysis.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-453 Course Title: Microcontrollers Lab
2- Contact Hours: L: 0 T: 0 P: 2
3- Examination Duration (Hrs.): Lab 02
4- Credits: 1

OBJECTIVES:

- Discuss the major components that constitute an embedded system.
- Implement small programs to solve we well-define problem on an embedded platform.
- Develop familiarity with tools used to develop in an embedded environment.

EXPERIMENTS:

1 To Generate 10KHz square wave using 8051 microcontroller.
2 To study the implementation and interfacing of LCD.
3 To study implementation and interfacing of LED.
4 To study implementation and interfacing of seven segment display.
5 To study implementation and interfacing stepper motor with 8051 microcontroller.
6 To study implementation and interfacing of relay with 8051 microcontroller.
7 To study implementation and interfacing of keypad with 8051 microcontroller.

COURSE OUTCOME:

- Understand what is microcontroller.
- Understand different components of a microcontroller and their interaction.
- Become familiar with programming environment used to develop embedded system
- Understand key concepts of embedded system like IO, Timer, Interrupts, interaction with peripheral devices.
- learn debugging techniques for an embedded system

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-454 Course Title: Digital Electronics Lab
2- Contact Hours: L: 0 T: 0 P: 2
3- Examination Duration (Hrs.): Lab 02
4- Credits: 1

OBJECTIVES:
Explain the elements of digital system abstractions such as digital representations of information, digital logic, Boolan algebra, state elements and finite state machine (FSMs).
Design simple digital systems based on these digital abstractions, using the "digital paradigm" including discrete sampled information.
Use the "tools of the trade": basic instruments, devices and design tools.
Work in a design team that can propose, design, successfully implement and report on a digital systems project.

EXPERIMENTS
1 Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2 Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3 Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4 Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5 Implementation of 4x1 multiplexer using logic gates.
6 Implementation of 4-bit parallel adder using 7483 IC.
7 Design, and verify the 4-bit synchronous counter.
8 Design, and verify the 4-bit asynchronous counter.

COURSE OUTCOMES
Describe how analog signals are used to represent digital values in different logic families, including characterization of the noise margins.
Create the appropriate truth table from a description of a combinational logic function.
Create a gate-level implementation of a combinational logic function described by a truth table using and/or/inv gates, MUXS or ROMs, and analyze its timing behavior.
Create a state transition diagram from a description of a sequential logic function and then convert the diagram into an implementation of a finite-state machine with the appropriate combinational and sequential components.
Describe the operation and timing constraints for latches and registers.
Draw a circuit diagram for a sequential logic circuit and analyze its timing properties (input setup and hold times, minimum clock period, output propagation delays).
Discuss how to interface digital circuits with analog components (ADC, DAC, sensors, etc.).

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-501 Course Title: Electromagnetic Waves
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

- Understand The Electrostatics, Magneto statics, Maxwell's Equations EM Wave Characteristics & Transmission Lines.

Unit No.	Particulars	Contact Hours
1	Transmission Lines- Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.	12
2	Maxwell's Equations- Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface.	12
3	Uniform Plane Wave- Uniform plane wave, Propagation of wave, Wave polarization, Poincare's Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor.	08
4	Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.	08
5	Wave propagation in parallel plane waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in Rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide. Radiation: Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, Receiving antenna, Monopole and Dipole antenna.	10

Course Outcomes:

At the end of this course students will demonstrate the ability to

- Understand characteristics and wave propagation on high frequency transmission lines
- Carryout impedance transformation on TL
- Use sections of transmission line sections for realizing circuit elements
- Analyze wave propagation on metallic waveguides in modal form
- Understand principle of radiation and radiation characteristics of an antenna

Text/Reference Books:

1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005
2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
3. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.
   David Cheng, Electromagnetics, Prentice Hall.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-502 Course Title: Computer Architecture
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

- Computer Types.
- Fixed and Floating point Representation
- Arithmetic operations
- Register Transfer Language
- Micro programmed Control
- Algorithms
- The Memory System
- Input – Output Organization
- Pipeline and Vector Processing
- Multiprocessors

Unit No.	Particulars	Contact Hours
1	Basic Structure of Computers, Functional units, software, performance issues software, machine instructions and programs, Types of instructions, Instruction sets: Instruction formats, Assembly language, Stacks, Ques, Subroutines.	12
2	Processor organization, Information representation, number formats. Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating point formats.	12
3	Control Design, Instruction sequencing, Interpretation, Hard wired control - Design methods, and CPU control unit. Microprogrammed Control - Basic concepts, minimizing microinstruction size, multiplier control unit. Microprogrammed computers - CPU control unit.	08
4	Memory organization, device characteristics, RAM, ROM, Memory management, Concept of Cache & associative memories, Virtual memory. System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfaces Concept of parallel processing, Pipelining, Forms of parallel processing, interconnect network	13

Course Outcomes

At the end of this course students will demonstrate the ability to

- learn how computers work
- know basic principles of computer's working
- analyze the performance of computers
- know how computers are designed and built
- Understand issues affecting modern processors (caches, pipelines etc.).

Text/Reference Books:

1. V.Carl Hammacher, "Computer Organisation", Fifth Edition.
2. A.S.Tanenbum, "Structured Computer Organisation", PHI, Third edition
3. Y.Chu, "Computer Organization and Microprogramming", II, Englewood Chiffs, N.J., Prentice Hall Edition
4. M.M.Mano, "Computer System Architecture", Edition
5. C.W.Gear, "Computer Organization and Programming", McGraw Hill, N.V. Edition
   Hayes J.P, "Computer Architecture and Organization", PHI, Second edition.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-503 Course Title: Probability Theory and Stochastic Processes
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

- Overview of elementary probability;
- Discrete and continuous random variables and their statistical properties;
- Important random variables and their applications;
- Functions of random variables;
- Sequence of random variables, random vectors, notions of convergence;
- Random processes: Classification and characterization;

Unit No.	Particulars	Contact Hours
1	Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models.	12
2	Discrete random variables, probability mass function, probability distribution function, example random variables and distributions; Continuous random variables, probability density function, probability distribution function, example distributions.	12
3	Joint distributions, functions of one and two random variables, moments of random variables, Conditional distribution, densities and moments; Characteristic functions of a random variable, Markov, Chebyshev and Chernoff bounds.	08
4	Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem.	13
5	Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density	10

Course Outcomes:

At the end of this course students will demonstrate the ability to

- Understand representation of random signals
- Investigate characteristics of random processes
- Make use of theorems related to random signals
- To understand propagation of random signals in LTI systems.

Text/Reference Books:

1. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education
2. A.Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill.
3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability, UBS Publishers,
5. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Stochastic Processes, UBS Publishers
6. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-504 Course Title: Digital Signal Processing
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

- To introduce the concepts and techniques associated with the understanding of digital signal processing. To familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete time systems. To provide with an appBECEiation of applications for the techniques and mathematics used in this course.
- To gain an understanding of the significance of digital signal processing (DSP) in the fields of computing, telecommunications and other areas of Computer Science and Electronic/Electrical Engineering. To gain an appreciation of the technology and the software tools currently available and to study in detail some of the most important design techniques for DSP systems

Unit No.	Particulars	Contact Hours
1	Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling.	12
2	Reconstruction of signals; Discrete systems attributes, Z-Transform, Analysis of LSI systems, frequency Analysis, Inverse Systems, Discrete Fourier Transform (DFT),Fast Fourier Transform Algorithm, Implementation of Discrete Time Systems.	12
3	Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Lowpass, Bandpass, Bandstop and High pass filters.	08
4	Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multirate signal processing. Application of DSP.	13

Course Outcomes:

At the end of this course students will demonstrate the ability to

- Represent signals mathematically in continuous and discrete time and frequency domain
- Get the response of an LSI system to different signals
- Design of different types of digital filters for various applications

Text/Reference Books:

1. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH
2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.
3. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms And Applications, Prentice Hall, 1997.
4. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, 1992.
5. J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1992.
   D.J.DeFatta, J. G. Lucas andW.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-511 Course Title: Introduction to MEMS
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

To make students to gain basic knowledge onoverview of MEMS (Micro electro Mechanical System)and various fabrication techniques.
This enables them to design, analysis, fabrication and testing the MEMS based components.

Unit No.	Particulars	Contact Hours
1	Introduction and Historical Background, Scaling Effects. Micro/Nano Sensors, Actuators and Systems overview: Case studies.	10
2	Review of Basic MEMS fabrication modules: Oxidation, Deposition Techniques, Lithography (LIGA), and Etching. Micromachining: Surface Micromachining, sacrificial layer processes, Stiction; Bulk	12
3	Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding. Mechanics of solids in MEMS/NEMS: Stresses, Strain, Hookes's law, Poisson effect	12
4	Linear Thermal Expansion, Bending; Energy methods, Overview of Finite Element Method, Modeling of Coupled Electromechanical Systems.	10

Course Outcomes:

At the end of the course the students will be able to

- AppBECEiate the underlying working principles of MEMS and NEMS devices.
- Design and model MEM devices

Text/Reference Book:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalkrishnan K. N. Bhat, V. K. Aatre, Micro and Smart Systems, Wiley India, 2012.
2. S. E.Lyshevski, Nano-and Micro-Electromechanical systems: Fundamentals of Nano-and Microengineering (Vol. 8). CRC press, (2005).
3. S. D. Senturia, Microsystem Design, Kluwer Academic Publishers, 2001.
4. M. Madou, Fundamentals of Microfabrication, CRC Press, 1997.
5. G. Kovacs, Micromachined Transducers Sourcebook, McGraw-Hill, Boston, 1998.
6. M.H. Bao, Micromechanical Transducers: Pressure sensors, accelerometers, and Gyroscopes, Elsevier, New York, 2000.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-001 Course Title: Image processing
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

To study the image fundamentals and mathematical transforms necessary for image processing.
To study the image enhancement techniques
To study image restoration procedures.
To study the image compression procedures.

Unit No.	Particulars	Contact Hours
1	Digital Image Fundamentals-Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures.	12
2	Image Enhancements and Filtering-Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain Image Segmentation- Detection of discontinuities, edge linking and boundary detection, thresholding – global and adaptive, region-based segmentation.	15
3	Wavelets and Multi-resolution image processing- Uncertainty principles of Fourier Transform, Time-frequency localization, continuous wavelet transforms, wavelet bases and multi-resolution analysis, wavelets and Subband filter banks, wavelet packets. Image Compression-Redundancy–inter-pixel and psycho-visual; Lossless compression – predictive, entropy; Lossy compression- predictive and transform coding; Discrete Cosine Transform; Still image compression standards – JPEG and JPEG-2000.	15
4	Fundamentals of Video Coding- Inter-frame redundancy, motion estimation techniques – full-search, fast search strategies, forward and backward motion prediction, frame classification – I, P and B; Video sequence hierarchy – Group of pictures, frames, slices, macro-blocks and blocks; Elements of a video encoder and decoder; Video coding standards – MPEG and H.26X.	10
5	Video Segmentation- Temporal segmentation–shot boundary detection, hard-cutsand soft-cuts; spatial segmentation – motion-based; Video object detection and tracking.	10

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

- Mathematically represent the various types of images and analyze them.
- Process these images for the enhancement of certain properties or for optimized use of the resources.
- Develop algorithms for image compression and coding

Text/Reference Books:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008
2. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004

Murat Tekalp , Digital Video Processing" Prentice Hall, 2nd edition 2015.

Department Of Electronics & Communication Engineering

1-Subject Code: BECE-002 Course Title: Filter Design
2- Contact Hrs: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:

1. Concept of filter basics.
2. Basics of Analog and digital filter design
3. Pole Zero Plot
4. Adaptive filter Theory

Unit No.	Particulars	Contact Hours
1	Introduction to Filters-Filter Selectivity. Low pass Filters, High pass Filters, Band pass Filters, Band stop Filters, Filter Approximation Filter Implementation, Conclusion, Analog Filter Approximation Functions, Filter Transfer Functions, Transfer Function Characterization, Pole-Zero Plots and Transfer Functions ,Normalized Transfer Functions	9
2	Analog Filter Implementation Using Active Filters - Implementation Procedures for Analog Filters, Low pass Active Filters Using Op-amps, High pass Active Filters Using Op-amps, Band pass Active Filters Using Op-amps, Band stop Active Filters Using Op-amps, Implementing Complex Zeros with Active Filters, Analog Filter, Implementation Issues, Component Selection, Sensitivity Analysis Conclusion	7
3	Introduction to Discrete-Time Systems- Analog-to-Digital Conversion Frequency Spectrum and Sampling Rate , Quantization of Samples A Complete Analog-to-Digital-to-Analog System, Linear Difference Equations and Convolution , Linear Difference Equations Impulse Response and Convolution , Discrete-Time Systems and *z*-Transforms , Frequency Response of Discrete-Time Systems.	7
4	Adaptive Filters- Introduction , Examples of Adaptive filtering, System Modeling, Adaptive Equalization, Adaptive Line Enhancer, Adaptive Noise Cancelling, Echo Cancellation, Digital Representation of Speech Signals, The Minimum Mean Square Error Criterion-MMSE	8

Text/References:

1. "Practical Analog and Digital Filter Design by Les Thede", Artech. House Inc. 2004 (Online PDF Version).
2. Analog and Digital Filter Design by Winder S, 2nd Edition by EDN Series, 2002
3. Operational Amplifiers & Linear Integrated Circuits: Theory and Application / 3E

4. Op-Amps and Linear Integrated Circuits by Ramakant A. Gayakwad, Pearson Edition, Fourth Edt.
5. Linear Integrated Circuits -2nd Edition , D Roy Choudhury, Shail B Jain, New Age International (P) Limited Publishers, 2003.
6. Class Notes hand written and PDF version.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-551 Course Title: Electromagnetic Waves Lab
2- Contact Hours: L: 0 T: 0 P: 2
3- Examination Duration (Hrs.): Theory 03
4- Credits: 1

Experiments:

1. Electrical Field and Potential inside the Parallel Plate Capacitor
2. Capacitance and Inductance of Transmission Lines
3. Simulation of Electric Field and Potential Inside Capacitors.
4. Magnetic Field Outside a Straight Conductor.
5. Magnetic Field of Coils.
6. Magnetic Force on a Current Carrying Conductor.
7. Magnetic Induction.
8. E.M Wave Radiation and Propagation of a Horn Antenna.
9. E.M Wave Transmission and Reflection.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-554 Course Title: Digital Signal Processing Lab
2- Contact Hours: L: 0 T: 0 P: 2
3- Examination Duration (Hrs.): Theory 03
4- Credits: 1

Experiments:

1. With the help of Fourier series, make a square wave from sine wave and cosine waves. Find out coefficient values.
2. Evaluate 4 point DFT of and IDFT of $x(n) = 1, 0 \leq n \leq 3$; 0 elsewhere.
3. Implement the FIR Filters for 2 KHz cutoff frequency and 2 KHz bandwidth for band pass filter.
4. Design FIR filter using Fourier series expansion method.
5. Implement IIR low pass filter for a 4 KHz cutoff frequency and compare it the FIR filter with the same type use chirp as input signal.
6. Verify Blackman and Hamming windowing techniques for square wave as an input which window will give good results.
7. Implement the filter functions.
8. Generate DTMF sequence 1234567890*# and observe its spectrogram.
9. Generate an Amplitude Modulation having side low frequencies 1200 Hz and 800 Hz. Observe and verify the theoretical FFT characteristics with the observed ones.
10. Generate Frequency Modulation having carrier frequencies 1 KHz and modulating frequency 200 Hz with the modulation index of 0.7. Observe and verify the theoretical FFT characteristics with the observed ones.
11. Generate an FSK wave form for transmitting the digital data of the given bit sequence. Predict and verify the FFT for the same one.
12. To study the circular convolution.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-601 Course Title: Control Systems
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:

- To develop the theoretical aspects of Control systems and feedbacks.
- To present the essential knowledge to understand AC, DC servo meters.
- To analyze steady state analysis of control systems.
- To study the concepts of root locus and adding of zeros and poles
- To understand the frequency response analysis and specifications of control systems with transfer function.
- To perform stability analysis in frequency domain
- To provide knowledge in Solving the Time invariant state Equations.

Unit No.	Particulars	Contact Hours
1	Introduction to control problem- Industrial Control examples. Transfer function. System with dead-time. System response. Control hardware and their models: potentiometers, synchros, LVDT, dc and ac servomotors, tacho-generators, electro hydraulic valves, hydraulic servomotors, electro pneumatic valves, pneumatic actuators. Closed-loop systems. Block diagram and signal flow graph analysis.	12
2	Feedback control systems- Stability, steady-state accuracy,transient accuracy, disturbance rejection, insensitivity and robustness. proportional, integral and derivative systems. Feed-forward and multi-loop control configurations, stability concept, relative stability, Routh stability criterion.	12
3	Time response of second-order systems, steady-state errors and error constants. Performance specifications in time-domain. Root locus method of design. Lead and lag compensation.	10
4	Frequency-response analysis- Polar plots, Bode plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency-domain. Frequency-domain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation. Op-amp based and digital implementation of compensators. Tuning of process controllers. State variable formulation and solution.	15
5	State variable Analysis- Concepts of state, state variable, state model, state modelsfor linear continuous time functions, diagonalization of transfer function, solution of state equations, concept of controllability & observability. Introduction to Optimal control & Nonlinear control, Optimal Control problem,Regulator problem, Output regulator, treking problem. Nonlinear system – Basic concept & analysis.	10

Course Outcomes:

At the end of this course students will demonstrate the ability to

- Characterize a system and find its study state behavior.
- Investigate stability of a system using different tests.

- Design various controllers.
- Solve liner, non-liner and optimal control problems.

Text/Reference Books:

- Gopal. M., "Control Systems: Principles and Design", Tata McGraw-Hill, 1997.
- Kuo, B.C., "Automatic Control System", Prentice Hall, sixth edition, 1993.
- Ogata, K., "Modern Control Engineering", Prentice Hall, second edition, 1991.
- Nagrath & Gopal, "Modern Control Engineering", New Age International, New Delhi.

Department Of Electronics & Communication Engineering

1- Subject Code: BCSE-602 Course Title: Computer Network
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:

- To develop the theoretical aspects of Computer systems.
- To present the essential knowledge to understand computer networks..

Unit No.	Particulars	Contact Hours
1	Switching in networks: Classification and requirements of switches, a generic switch, Circuit Switching, Time-division switching, Space-division switching, Crossbar switch and evaluation of blocking probability, 2-stage, 3-stage and n-stage networks, Packet switching, Blocking in packet switches, Three generations of packet switches, switch fabric, Buffering, Multicasting, Statistical.	12
2	Introduction to computer networks and the Internet: Application layer: Principles of network applications, The Web and Hyper Text Transfer Protocol, File transfer, Electronic ail, Domain name system, Peer-to-Peer file sharing, Socket programming, Layering concepts.	12
3	Multiplexing. Transport layer: Connectionless transport - User Datagram Protocol, Connection-oriented transport – Transmission Control Protocol, Remote Procedure Call. Transport layer: Connectionless transport - User Datagram Protocol, Connection-oriented transport – Transmission Control Protocol, Remote Procedure Call.	10
4	Congestion Control and Resource Allocation: Issues in Resource Allocation, Queuing Disciplines, TCP congestion Control, Congestion Avoidance Mechanisms and Quality of Service.	10
5	Network layer: Virtual circuit and Datagram networks, Router, Internet Protocol, Routing algorithms, Broadcast and Multicast routing Link layer: ALOHA, Multiple access protocols, IEEE 802 standards, Local Area Networks, addressing, Ethernet, Hubs, Switches.	10

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the concepts of networking thoroughly.
2. Design a network for a particular application.
3. Analyze the performance of the network.

Text Reference books:

1. J.F. Kurose and K. W. Ross, "Computer Networking – A top down approach featuring the Internet", Pearson Education, 5th Edition
2. L. Peterson and B. Davie, "Computer Networks – A Systems Approach" Elsevier Morgan Kaufmann Publisher, 5th Edition.
3. T. Viswanathan, "Telecommunication Switching System and Networks", Prentice Hall
4. S. Keshav, "An Engineering Approach to Computer Networking" , Pearson Education
5. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Editio
6. Andrew Tanenbaum, "Computer networks", Prentice Hall
7. D. Comer, "Computer Networks and Internet/TCP-IP", Prentice Hall
8. William Stallings, "Data and computer communications", Prentice Hall

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-611 Course Title: Bio-medical Electronics
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:

- Introduction to various Concepts of Medical Instrumentation.

Unit No.	Particulars	Contact Hours
1	Components of Medical Instrumentation System: Bioamplifier. Static and dynamic characteristics of medical instruments. Biosignals and characteristics. Problems encountered with measurements from human beings.	12
2	Organisation of cell: Nernst equation for membrane Resting Potential Generation and Propagation of Action Potential, Conduction through nerve to neuromuscular junction. Bio Electrodes: Biopotential Electrodes-External electrodes, Internal Electrodes. Biochemical Electrodes.	12
3	Mechanical function: Electrical Conduction system of the heart. Cardiac cycle. Relation between electrical and mechanical activities of the heart. Cardiac Instrumentation: Blood pressure and Blood flow measurement. Specification of ECG machine. Einthoven triangle, Standard 12-lead configurations, Interpretation of ECG waveform with respect to electro mechanical activity of the heart.	10
4	Neuro-Muscular Instrumentation: Specification of EEG and EMG machines. Electrode placement for EEG and EMG Recording. Intrepretation of EEG and EMG.	10
5	Therapeutic equipment: Pacemaker, Defibrillator, Shortwave diathermy. Haemodialysis machine. Respiratory Instrumentation: Mechanism of respiration, Spirometry, Pnemuotachograph Ventilators.	12

Course Outcome:

- The student is expected to know the working and design of instruments used in Heath care .

TEXT BOOKS:

Hand-book of Biomedical Instrumentation – by R.S. Khandpur, McGraw-Hill, 2003.
Medical Instrumentation, Application and Design – by John G. Webster, John Wiley.
Principles of Applied Biomedical Instrumentation – by L.A. Geoddes and L.E. Baker, John Wiley and Sons.
Biomedical Equipment Technology – Carr & Brown, Pearson

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-003 Course Title: Electronic Measurement
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:

Understand the internal structure of all instruments that are used in measuring parameters related to electronics and also difference between analog meters and digital meters and their performance characteristics

Unit No.	Particulars	Contact Hours
1	Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter.	13
2	Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, multimeter probes Digital voltmeter systems, digital multimeters, digital frequency meter system.	12
3	Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter.	10
4	CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications.	10
5	Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y Recorders, plotters	12

Course Outcomes:

Students can understand about different instruments that are used are used for measurement purpose.
They can analyze the Performance characteristics of each instrument.
Understanding about different types of signal generators and Recorders.
Students can calculate all the parameters related to measurements.
They can understand how waveforms can be analyzed using wave analyzers.
Understanding the basic features of oscilloscope and its internal structures and different types
Understanding of how different bridge networks are constructed and balanced for finding out values of resistance, capacitance and inductance.
Understanding about different transducers and their working principles.
Students can understand how different physical parameters like pressure, force, velocity etc. can be measured.
Internal and general repairing of instruments and problem solving capacity.

Text Books:

David A. Bell, “Electronic Instrumentation and Measurements”, 2nd Ed., PHI , New Delhi 2008.
Oliver and Cage, “Electronic Measurements and Instrumentation”, TMH, 2009.
Alan S. Morris, “Measurement and Instrumentation Principles”, Elsevier (Buterworth Heinmann), 2008

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-651 Course Title: Electronics Measurement Lab
2- Contact Hours: L: 0 T: 0 P: 2
3- Examination Duration (Hrs.): Theory 03
4- Credits: 1

List of Experiments

1. Designing DC bridge for Resistance Measurement (Quarter, Half and Full bridge)
2. Designing AC bridge Circuit for capacitance measurement
3. Designing signal Conditioning circuit for Pressure Measurement
4. Designing signal Conditioning circuit for Temperature Measurement
5. Designing signal Conditioning circuit for Torque Measurement
6. Designing signal Conditioning circuit for Strain Measurement
7. Experimental study for the characteristics of ADC and DAC
8. Error compensation study using Numerical analysis using MATLAB (regression)

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Design and validate DC and AC bridges
2. Analyze the dynamic response and the calibration of few instruments
3. Learn about various measurement devices, their characteristics, their operation and their limitations
4. understand statistical data analysis
5. Understand computerized data acquisition.

Department Of Electronics & Communication Engineering

1- Subject Code: BCSE-652 Course Title: Computer Networks Lab
2- Contact Hours: L: 0 T: 0 P: 4
3- Examination Duration (Hrs.): Theory 03
4- Credits: 2

List of Experiments

1. Study of different types of Network cables and Practically implement the cross-wired cable and straight through cable using clamping tool.
2. Install and Configure Wired and Wireless NIC and transfer files between systems in LAN and Wireless LAN.
3. Install and configure Network Devices: HUB, Switch and Routers.
4. Connect the computers in Local Area Network.
5. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN (TCP/IP Configuration).
6. Establish Peer to Peer network connection using two systems using Switch and Router in a LAN. Configure Internet connection and use IPCONFIG, PING / Tracer and Net stat utilities to debug the network issues.
7. Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network.
8. Study of basic network command and Network configuration commands.
9. Configure a Network topology using packet tracer software

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-653 Course Title: Electronic Design Workshop
2- Contact Hours: L: 0 T: 0 P: 4
3- Examination Duration (Hrs.): Theory 03
4- Credits: 2

Guidelines:

1. The mini-project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design.
2. The mini project may be a complete hardware or a combination of hardware and software. The software part in mini project should be less than 50% of the total work.
3. Mini Project should cater to a small system required in laboratory or real life.
4. It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced.
5. After interactions with course coordinator and based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of mini-project.
6. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
7. The student is expected to exert on design, development and testing of the proposed work as per the schedule.
8. Art work and Layout should be made using CAD based PCB simulation software. Due considerations should be given for power requirement of the system, mechanical aspects for enclosure and control panel design.
9. Completed mini project and documentation in the form of mini project report is to be submitted at the end of semester.

The tutorial sessions should be used for discussion on standard practices used for electronic circuits/product design, converting the circuit design into a complete electronic product, PCB design using suitable simulation software, estimation of power budget analysis of the product, front panel design and mechanical aspects of the product, and guidelines for documentation /report writing.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Conceive a problem statement either from rigorous literature survey or from the requirements raised from need analysis.
2. Design, implement and test the prototype/algorithm in order to solve the conceived problem.
3. Write comprehensive report on mini project work.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-711 Course Title: Microwave Theory and Techniques
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:
Understand Microwave devices, components, their characteristics, their working , and their applications.

Unit No.	Particulars	Contact Hours
1	Introduction to Microwaves-History of Microwaves, Microwave Frequency bands; Applications of Microwaves: Civil and Military, Medical, EMI/ EMC. Mathematical Model of Microwave Transmission-Concept of Mode, Features of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission. Analysis of RF and Microwave Transmission Lines- Coaxial line, Rectangular waveguide, Circular waveguide, Strip line, Micro strip line. Microwave Network Analysis-Equivalent voltages and currents for non-TEM lines, Network parameters for microwave circuits, Scattering Parameters.	13
2	Passive and Active Microwave Devices- Microwave passive components: Directional Coupler, Power Divider, Magic Tee, Attenuator, Resonator. Microwave active components: Diodes, Transistors, Oscillators, Mixers. Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes. Microwave Tubes: Klystron, TWT, Magnetron.	12
3	Microwave Design Principles- Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power Amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design. Microwave Antennas- Antenna parameters, Antenna for ground based systems, Antennas for airborne and satellite borne systems, Planar Antennas.	10
4	Microwave Measurements- Power, Frequency and impedance measurement at microwave frequency, Network Analyzer and measurement of scattering parameters, Spectrum Analyzer and measurement of spectrum of a microwave signal, Noise at microwave frequency and measurement of noise figure. Measurement of Microwave antenna parameters.	10
5	Microwave Systems- Radar, Terrestrial and Satellite Communication, Radio Aidsto Navigation, RFID, GPS. Modern Trends in Microwaves Engineering-Effect of Microwaves on human body, Medical and Civil applications of microwaves, Electromagnetic interference and Electromagnetic Compatibility (EMI & EMC), Monolithic Microwave ICs, RFMEMS for microwave components, Microwave Imaging.	12

Course Outcomes:

At the end of the course, students will demonstrate the ability to:
Understand various microwave system components their properties.
Appreciate that during analysis/ synthesis of microwave systems, the different mathematical treatment is required compared to general circuit analysis.
Design microwave systems for different practical application.

Text /Reference Books:

1. R.E. Collins, Microwave Circuits, McGraw Hill
2. K.C. Gupta and I.J. Bahl, Microwave Circuits, Artech house

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-721 Course Title: Fiber Optic Communications
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:
To expose the students to the basics of signal propagation through optical fibers, fiber impairments, components and devices and system design.

Unit No.	Particulars	Contact Hours
1	Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model.	10
2	Different types of optical fibers, Modal analysis of a step index fiber. Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers and measurement techniques like OTDR	12
3	Optical sources - LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detector responsivity, noise, optical Receivers. Optical link design - BER calculation, quantum limit, power penalties.	10
4	Optical switches - coupled mode analysis of directional couplers, electro-opticswitches. Optical amplifiers - EDFA, Raman amplifier. WDM and DWDM systems. Principles of WDM networks.	10
5	Nonlinear effects in fiber optic links. Concept of self-phase modulation, group velocity dispersion and soliton based communication.	12

Course Outcomes:
At the end of the course, students will demonstrate the ability to:

Understand the principles fiber-optic communication, the components and the bandwidth advantages.
Understand the properties of the optical fibers and optical components.
Understand operation of lasers, LEDs, and detectors .
Analyze system performance of optical communication systems.
Design optical networks and understand non-linear effects in optical fibers.

Text/Reference Books:

J. Keiser, Fibre Optic communication, McGraw-Hill, 5th Ed. 2013 (Indian Edition).
T. Tamir, Integrated optics, (Topics in Applied Physics Vol.7), Springer-Verlag, 1975.
J. Gowar, Optical communication systems, Prentice Hall India, 1987.
S.E. Miller and A.G. Chynoweth, eds., Optical fibres telecommunications, Academic Press, 1979.
G. Agrawal, Nonlinear fibre optics, Academic Press, 2nd Ed. 1994.
G. Agrawal, Fiber optic Communication Systems, John Wiley and sons, New York, 1997
F.C. Allard, Fiber Optics Handbook for engineers and scientists, McGraw Hill, New York (1990).

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-731 Course Title: Satellite Communications
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:

1) Preparation for Profession :To inculcate professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach in the students.

2) Develop an ability to relate engineering issues to broader social context and equip them with strong knowledge, competence and soft skills that allows them to contribute to the needs of industry, consultancy, government and academia.

Unit No.	Particulars	Contact Hours
1	Introduction to Satellite Communication: Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication. Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.	10
2	Satellite sub-systems: Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc.	12
3	Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift, satellite link budget.	10
4	Flux density and Received signal power equations, Calculation of System noise temperature for satellite Receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions.	10
5	Modulation and Multiple Access Schemes: Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.	12

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Visualize the architecture of satellite systems as a means of high speed, high range communication system.
2. State various aspects related to satellite systems such as orbital equations, sub-systems in a satellite, link budget, modulation and multiple access schemes.
3. Solve numerical problems related to orbital motion and design of link budget for the given parameters and conditions.

Text /Reference Books:

1. Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications: Wiley India. 2nd edition 2002
2. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009

Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill,2009

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-005 Course Title: Entrepreneurship Development
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:

1. To identify and train potential entrepreneurs.
2. To motivate the entrepreneurial instinct.
3. To develop necessary knowledge and skills among the participants.
4. To help in analysing the various options to select the most appropriate product suiting to the entrepreneur and the market.
5. To give a clear picture about the process and procedures involved in setting up an small scale Industrial unit or a bigger unit.
6. To develop and strengthen entrepreneurial quality and motivation.
7. To impart basic managerial skills and understandings to run the project efficiently and effectively.
8. To analyst the environmental issues to be addressed relating to the proposed project.
9. To develop various business related skills of marketing, quality management production, distribution and human resource management etc.
10. To make the potential entrepreneurs know about the possible risks and failures of the project and make them learn how to overcome these problems.
11. To enable the entrepreneurs to communicate clearly and effectively.
12. To develop team building, technology up-gradation, growth and above all broad vision about the business.
13. To develop a passion for integrity, honesty and industrial discipline.
14. To make him learn the basics of Industrial Laws, Factories Act and workers rights and expectations so that he can easily overcome the legal problems.
15. To formulate the detailed Project Report.

Unit No.	Particulars	Contact Hours
1	**Entrepreneurship**- definition. Growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.	10
2	**Project identification**- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.	12
3	Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.	10
4	Project Planning and control: The financial functions cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. Profit planning and programming, planning cash flow, capital expenditure and operations. Control of financial flows, control and communication.	10
5	Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. 5 Role of various national and state agencies which render assistance to small scale industries.	12

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

Explain the major concepts in the functional areas of Engineering and relevant fields.
Evaluate the legal, social, and economic environments of business.
Describe the global environment of business.
Describe and explain the ethical obligations and responsibilities of business.
Apply decision-support tools to business decision making.
Construct and present effective oral and written forms of professional communication.
Apply knowledge of business concepts and functions in an integrated manner.
Use specialized knowledge to solve business processes.
Manage people, processes, and resources within a diverse organization.
Apply knowledge of key leadership concepts in an integrated manner.
Construct and present a written business plan for a prospective start-up or entrepreneurial expansion.

Text /Reference Books:

Forbat, John, “Entrepreneurship” New Age International.
Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International.
Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-751 Course Title: Project stage I
2- Contact Hours: L: 0 T: 0 P: 10
3- Examination Duration (Hrs.): Theory 03
4- Credits: 5

Objectives: : The object of Project Work I is to enable the student to take up investigative study in the broad field of Electronics & Communication Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

- Survey and study of published literature on the assigned topic;
- Working out a preliminary Approach to the Problem relating to the assigned topic;
- Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;
- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final Seminar, as oral Presentation before a departmental committee.

Course Outcomes:

- At the end of the course, students will demonstrate the ability to:

Identify and describe the problem and scope of project clearly.
Collect, analyze and present data into meaningful information using relevant tools, select, plan and execute a proper methodology in problem solving.
Work independently and ethically, present the results in written and oral format effectively and identify basic entrepreneurship skills in project management.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-811 Course Title: Mobile Communication and Networks
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:

By the end of the course, the student will be able to analyze and design wireless and mobile cellular systems.

By the end of the course, the student will have the ability to work in advanced research wireless and mobile cellular programs

Unit No.	Particulars	Contact Hours
1	Cellular concepts- Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, capacity, power control; Wireless Standards: Overview of 2G and 3G cellular standards. Signal propagation-Propagation mechanism- reflection, refraction, diffraction and scattering, large scale signal propagation and lognormal shadowing. Fading channels-Multipath and small scale fading- Doppler shift, statistical multipath channel models, narrowband and wideband fading models, power delay profile, average and rms delay spread, coherence bandwidth and coherence time, flat and frequency selective fading, slow and fast fading, average fade duration and level crossing rate.	10
2	Capacity of flat and frequency selective channels. Antennas- Antennas for mobile terminal-monopole antennas, PIFA, base station antennas and arrays.	12
3	Multiple access schemes-FDMA, TDMA, CDMA and SDMA. Modulation schemes- BPSK, QPSK and variants, QAM, MSK and GMSK, multicarrier modulation, OFDM.	10
4	Receiver structure- Diversity Receivers- selection and MRC Receivers, RAKE Receiver, equalization: linear-ZFE and adaptive, DFE. Transmit diversity-Altamonte scheme	10
5	MIMO and space time signal processing, spatial multiplexing, diversity/multiplexing tradeoff. Performance measures- Outage, average snr, average symbol/bit error rate. System examples- GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA.	12

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the working principles of the mobile communication systems.
2. Understand the relation between the user features and underlying technology.
3. Analyze mobile communication systems for improved performance

Text /Reference Books:

1. WCY Lee, Mobile Cellular Telecommunications Systems, McGraw Hill, 1990.
2. WCY Lee, Mobile Communications Design Fundamentals, Prentice Hall, 1993.
3. Raymond Steele, Mobile Radio Communications, IEEE Press, New York, 1992.
4. AJ Viterbi, CDMA: Principles of Spread Spectrum Communications, Addison Wesley, 1995.
5. VK Garg &JE Wilkes, Wireless & Personal Communication Systems, Prentice Hall, 1996.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-821 Course Title: Antennas and Propagation
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:
It covers all the fundamental antenna concepts.
It deals with field equations and power and phase patterns of the point sources and array antennas.
It gives concise description of different types of antennas.
It explains the different types of propagation.

Unit No.	Particulars	Contact Hours
1	Fundamental Concepts- Physical concept of radiation, Radiation pattern, near- and far-field regions, Reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions. Radiation from Wires and Loops- Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.	10
2	Aperture and Reflector Antennas- Huygens' principle, radiation from Rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas.Broadband Antennas- Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas.	12
3	Micro strip Antennas- Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of Rectangular and circular patch antennas.	10
4	Antenna Arrays- Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays, synthesis of antenna arrays using Schelkunoff polynomial method, Woodward-Lawson method.	10
5	Basic Concepts of Smart Antennas- Concept and benefits of smart antennas, fixed weight beam forming basics, Adaptive beam forming. Different modes of Radio Wave propagation used in current practice.	12

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

- Understand the properties and various types of antennas.
- Analyze the properties of different types of antennas and their design.
- Operate antenna design software tools and come up with the design of the antenna of required specifications.

Text /Reference Books:

J.D. Kraus, Antennas, McGraw Hill, 1988.
C.A. Balanis, Antenna Theory - Analysis and Design, John Wiley, 1982.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-006 Course Title: Non Conventional energy Resources
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:

1. To harness green and clean renewable energy sources in the State for environment benefits, mitigate Global warming/Climate change and Energy Security.
2. To have Renewable Energy projects across the State either on grid or off-grid mode.
3. To conserve & promote Energy Efficiency & Energy Conservation measures in Industrial, Commercial and Government establishments including domestic buildings.

Unit No.	Particulars	Contact Hours
1	Introduction Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. Solar Cells: Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.	10
2	Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.	12
3	Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.	10
4	Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations. Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.	10
5	Bio-mass: Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants.	12

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. To harness the environment friendly RE sources and to enhance their contribution to the socio-economic development.
2. To meet and supplement rural energy needs through sustainable RE projects.
3. To provide decentralized energy supply to agriculture, industry, commercial and household sector.
4. To supplement efforts in bridging the gap between demand and supply of power, with renewable energy sources and strengthening the grid system and evacuation arrangements for RE projects.
5. To support efforts for developing, demonstrating and commercializing new and emerging technologies in the RE sector, and to this end, help establish linkages with national and international institutions for active collaboration.
6. To create public awareness and involve users/local community along with capacity building in establishing, operating and managing RE projects.
7. To establish dedicated renewable energy "Special Economic Zones" (SEZ) to promote renewable energy projects.
8. To give necessary support & facilitation to the entrepreneurs and investors to successfully implement RE projects to produce more renewable energy without delay and to attract more investment in state by the private developers.
9. To initiate necessary measures in energy conservation as per the guidelines of Bureau of Energy Efficiency (BEE), Government of India.
10. To create direct and indirect employment opportunities especially in rural and backward areas.

Text /Reference Books:

Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
M.V.R. Koteswara Rao, " Energy Resources: Conventional & Non-Conventional " BSP Publications,2006.
D.S. Chauhan,"Non-conventional Energy Resources" New Age International.
C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-007 Course Title: VLSI circuits
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3
Objectives:
To understand the basic concepts of the VLSI.

Unit No.	Particulars	Contact Hours
1	Introduction: Overview of VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality. MOSFET Fabrication: Fabrication process flow, NMOS and CMOS fabrication, layout design rules, stick diagram and mask layout design. MOS Transistor : MOS Structure, The MOS System under external bias, Operation of MOSFET, MOSFET - Current /Voltage Characteristics, Scaling and Small geometry effects and capacitances.	10
2	MOS Inverters: Introduction, Resistive Load Inverter, Inverters with n-type MOSFET load, CMOS Inverter. MOS Inverters - Switching Characteristics: Introduction, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.	12
3	Combinational MOS Logic Circuits: Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits, complex logic circuits, CMOS transmission gates (pass gates) Sequential MOS Logic Circuits: Introduction, behaviour bistable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF.	10
4	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	10
5	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques.	12

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

To use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect.
To create models of moderately sized CMOS circuits that realizes specified digital functions.
To apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
To have an understanding of the characteristics of CMOS circuit construction and the comparison between different state-of-the-art CMOS technologies and processes.

To complete a significant VLSI design project having a set of objective criteria and design constraints.
To demonstrate the fundamentals of IC technology such as various MOS fabrication technologies
To calculate electrical properties of MOS circuits such as Ids -Vds relationship, gm, figure of merit, sheet resistance, area capacitance.
To design various gates, adders, Multipliers, Memories, using stick diagrams, layouts.
To demonstrate semiconductor IC design such as PLA's, PAL, FPGA, CPLD's design.

Text /Reference Books:

Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.
D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-009 Course Title: Digital System Design Using VHDL
2- Contact Hours: L: 3 T: 0 P: 0
3- Examination Duration (Hrs.): Theory 03
4- Credits: 3

Objectives:

5. Concept of synthesis.
6. Basics of Verilog HDL language, including its use in synthesis of digital design.
7. Verilog HDL coding style for synthesis.
8. Design of digital systems with Verilog HDL.
9. Modeling test bench Simulation and verification of designs with Verilog HDL.
10. Industrial-standard design software for coding, synthesis and simulation.
11. Hardware implementation of digital systems on FPGA devices.

Unit No.	Particulars	Contact Hours
1	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	9
2	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration.	7
3	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes.	7
4	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution.	8
5	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	9

LEARNING OUTCOMEs:

1. An ability to describe, design, simulates, and synthesizes computer hardware using the Verilog hardware description language.
   An ability to rapidly design combinational and sequential logic that works.
   An ability to rapidly design complex state machines (present in all practical computers) that work.
2. An ability to synthesize logic and state machines using an Automatic Logic Synthesis program.
   An ability to implement state machines using Field-Programmable GateArrays.
   An ability to design high-speed computer arithmetic circuits.
   An ability to design a computer to be fault-tolerant.

An ability to design a computer memory using error-correcting codes.
An ability to design a computer so that it can test itself with built-in circuitry.

3. An ability to design finite state machines.

TEXT BOOKS:

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Spriger Publication, 2010.

REFERENCE BOOKS:

1. C. H. Roth, "Digital System Design using VHDL", PWS Publishing.
2. Douglas Perry, "VHDL- Programming by examples", MGH.

Department Of Electronics & Communication Engineering

1- Subject Code: BECE-851 Course Title: Project stage II
2- Contact Hours: L: 0 T: 0 P: 18
3- Examination Duration (Hrs.): Theory 03
4- Credits: 9

Objectives: : The object of Project Work II is to enable the student to take up investigative study in the broad field of Electronics & Communication Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

- Survey and study of published literature on the assigned topic;
- Working out a preliminary Approach to the Problem relating to the assigned topic;
- Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;
- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final Seminar, as oral Presentation before a departmental committee.

Course Outcomes:

• At the end of the course, students will demonstrate the ability to:
Identify and describe the problem and scope of project clearly.
Collect, analyze and present data into meaningful information using relevant tools, select, plan and execute a proper methodology in problem solving.
Work independently and ethically, present the results in written and oral format effectively and identify basic entrepreneurship skills in project management.