DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING
Faculty of Engineering
University of Rajshahi

Syllabus for B.Sc. Engg. (EEE) Degree

Session: 2016-2017

Year of Examinations:

B.Sc. Engg. Part-I	:	2017
B.Sc. Engg. Part-II	:	2018
B.Sc. Engg. Part-III	:	2019
B.Sc. Engg. Part-IV	:	2020

Department of Electrical and Electronic Engineering
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Syllabus for B.Sc. in Electrical and Electronic Engineering Degree
Session: 2016-2017

Part-I Examination	**:**	**2017**
Part-II Examination	**:**	**2018**
Part-III Examination	**:**	**2019**
Part-IV Examination	**:**	**2020**

Introduction

Electrical and Electronic Engineering (EEE) encompasses a very wide area of knowledge and is considered as one of the most important engineering disciplines within the engineering society. The contributions of EEE are not limited to areas in applications such as power engineering, telecommunications and computer systems but also extended to instrumentation, manufacturing, information technology and many more. Electrical and Electronic Engineering is very dynamic and sensitive to technological advancement in the world. In fact, most of the technological revolution started from Electrical and Electronics.

Electrical and Electronic engineers are involved in the design and development of modern high technology applications such as automation for electromechanical systems, computer systems, embedded systems and electronic control systems applied in process plants, automotive industry, aerospace, and even maintenance. In other words, Electrical and Electronic engineers are highly demanded in various fields and its graduates are highly sought after by potential employers.

Objectives of EEE Programme are:

- To produce technically qualified Electrical and Electronics Engineers with the potential to become leaders of Electrical and Electronic Industries
- To produce Electrical and Electronics Engineers who are committed to sustainable development of Electrical and Electronic industries for the betterment of society and nation.

The courses on Bachelor of Science in Electrical and Electronic Engineering abbreviated as B.Sc. Engg. (EEE) programme at University of Rajshahi are designed to emphasize on a strong foundation in physics, mathematics, and chemistry, followed by a thorough coverage of basic electrical and electronic engineering courses such as circuit theory, analogue electronics, digital electronics, microprocessor, as well as signal and systems. At higher levels, students are exposed to data and computer networking, digital signal processing, VLSI system design, control theory, communication systems, and power electronics so that they are

- Able to acquire and apply knowledge of mathematics, basic science and engineering fundamentals to solve complex electrical and electronic engineering problems.
- Able to undertake complex electrical and electronic engineering problem identification, formulation and solution synthesis using fundamental knowledge, techniques and analytical skills to reach substantiated conclusions in complex engineering practice.
- Able to utilize system or subsystems approach to solve complex electrical and electronic engineering problem with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
- Able to investigate and solve complex problems using research knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusion in complex electrical and electronic engineering problems.
- Able to apply and synthesize, using techniques, skill and modern scientific ICT and/or engineering tools necessary for complex electrical and electronic engineering practice with an understanding of the limitations.
- Able to apply reasoning based on contextual knowledge in professional engineering practice to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
- Able to understand the impact of professional engineering solutions in societal and environmental context and demonstrate knowledge and need for sustainable development.
- Able to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

- Able to communicate effectively on complex engineering activities, not only with engineers but also with the community at large.
- Able to function effectively as an individual and in groups with the capacity to be a leader or member in multi-disciplinary settings.
- Able to recognize the need to undertake independent and life-long learning in continual technological development.
- Able to apply knowledge of engineering, business acumen, management principles and entrepreneurship in multidisciplinary environments as a member and leader in a team.

The courses designed for Bachelor of Science in Electrical and Electronic Engineering B.Sc. Engg. (EEE) consist of 4000 marks of 160 credits distributed over eight semesters in four academic years. Each academic year is divided into two semesters (Odd and Even) each of duration not less than 11 weeks (66 working days). There shall be final examinations at the end of each semester. The medium of answer in all examinations will be either Bangla or English, but not the mixer of both. The theoretical examination of courses less than or equal to 2 credits shall be of 2 hours duration and courses greater than 2 credits shall be of 3 hours duration. An academic schedule for an academic year shall be announced for general notification before the start of the academic year, on the prior approval of the academic committee.

The department of Electrical and Electronic Engineering (EEE) is one of the youngest departments of Rajshahi University which started its journey in September 2015. This department presently runs four years (eight semesters) B.Sc. Engineering program with an annual intake of 30 undergraduate students. It conducts education and research in four major areas of Electrical Power and Energy, Electronics, Communication and Computer with the goal of producing quality of graduates who can become leaders in the global arena to serve the society, and to conduct leading-edge research. The curriculum for the B.Sc. Engg. (EEE) has been designed to make the program goal-oriented.

The department is presently housed in the 3rd floor of the 1st Science Building.

List of Teaching Staff of the Department

Professors

1.	Abu Zafor Muhammad Touhidul Islam	B.Sc. Hons, M.Sc. (RU), Ph.D. (Japan)

Research Areas of the Teachers

Prof. Abu Zafor Muhammad Touhidul Islam	III-V Growth and Characterization, Optoelectronic Devices, Communication Systems Simulation

Laboratory Facilities of the Department

The departmental undergraduate courses are laboratory intensive and this requirement is expected to cater by the following laboratories:

1. Electrical Circuit Lab I, II
2. Computer Lab
3. Electronic Circuit Lab I, II
4. Digital Electronics and Microprocessor Lab
4. Electrical Machine Lab I, II
5. Power Electronics Lab
6. Measurement and Instrumentation Lab
7. Microprocessor and Microcomputer System Lab
8. Control System Lab
9. Power System Lab
10. Power system Protection and Switch gear lab
11. Communication Systems Lab
12. Microwave Engineering Lab
13. VLSI Lab
14. Digital Signal Processing Lab
15. Fabrication and Processing Lab

RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAMME

1. Duration of Course and Course Structure (Ref. Academic Ordinance Faculty of Engineering (AOFE) article no-4)

1.1 The B. Sc. Engg. programmes shall extend over a period of four academic years, each of a normal duration of one calendar year, divided into 2 Semesters; (details are given in Section 7 of the ordinance).

1.2 The curricula of the B. Sc. Engg. Degree in the different departments shall be proposed by the Committee of Courses and approved by the Syndicate on the recommendation of the Academic Council.

1.3 The Committee of Courses shall review the curricula at least once in every Academic Year and recommend changes and revision, if any, to the Faculty, and then the Faculty will recommend to the Academic Council .

1.4 Teaching of the courses is reckoned in terms of credits and the credits allotted to various courses will be determined by the Committee of Courses under the following guidelines;

Nature of course	Contact hour/credit (in a semester)
Theoretical Lecture	: 1 hour/week
Laboratory/Project	: 2 - 3 hours/week
Field work	: 2 weeks of field work

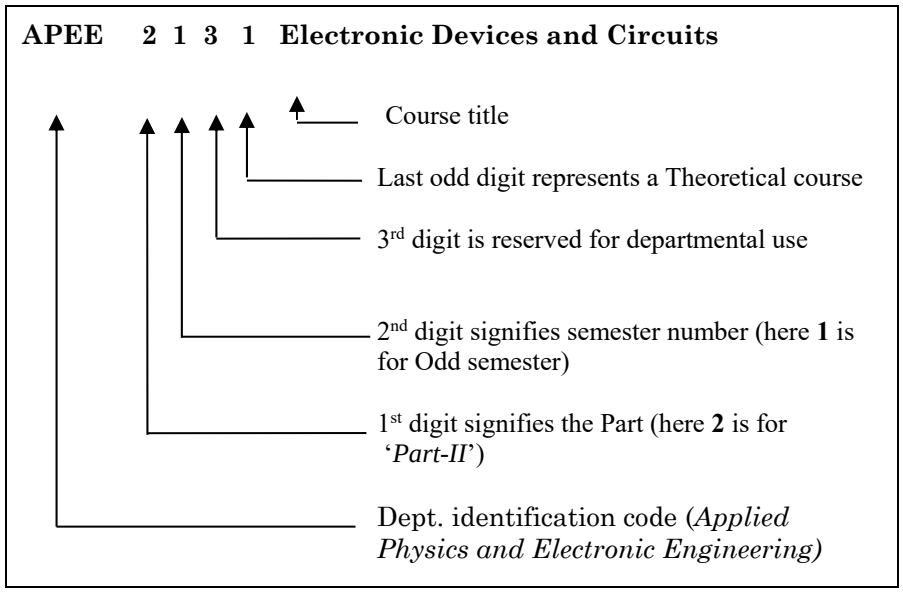
1.5 **Contact Hours/week:** The total contact hours for the regular students including lecture, tutorial and laboratory shall be between 24 - 42 periods per week, each period being 40 to 60 minutes in duration.

1.6 **Course Adviser**: In each degree-awarding department, one of the teachers nominated by the Academic Committee shall act as Course Advisor for each academic year.

1.7 With the approval of Academic Committee, Course Advisor will prepare and announce the class routine, showing details of the lectures, course plan, class test, etc. at the start of each semester.

1.8 C**ourse Designation:** Each course is designated by a two to four letter word usually identifying the course offering department followed by a four-digit number with the following criteria without any space between letters and numerical.

(a) The first digit will correspond to the Part (year) in which the course is normally taken by the students, (b) The second digit will correspond the semester (1 for odd and 2 for even) in which the course is normally taken by the students, (c) The third digit will be reserved for departmental use for such things as to identify different areas within a department, (d) The last digit will be odd for theoretical, even for laboratory courses and '0' for Board Viva voce and (e) The course designation system is illustrated by the following example.



2. Duration of Examination [**Ref**. AOFE article no- 6]

Duration of Theoretical examination of different courses at the end of semester shall be as follows :

Courses less than or equal to 2 Credits	2 Hours
Courses greater than 2 credits but less than or equal to 4 Credits	3 Hours

3. Academic Calendar [**Ref**. AOFE article no- 7]

3.1 The academic year shall be divided into two semesters each having duration of not less than 11 teaching weeks.

3.2 There shall be final examinations at the end of each semester conducted by the respective Examination Committee of the Departments.

3.3 **An academic schedule** for the academic year shall be announced for general notification before the start of the academic year, on the approval of the Academic Committee. The schedule may be prepared according to the following guidelines:

Semester-Odd (19 weeks)	Number of weeks
Teaching	**11** (66 working days)
Preparatory Leave	**2**
Examination Period	**2 - 3**
Result Publication	**3 - 4** **6**
	19

Inter Semester Recess	**1**
Semester-Even (19 weeks)	
Teaching	**11** (66 working days)
Preparatory Leave	**2**
Examination Period	**2 - 3**
Result Publication	**3 - 4** **6**
	19
Vacation (Summer, Ramadan, and Others)	**13**
Total:	**52**

4. Attendance [Ref. AOFE article no-13]

In order to be eligible to appear, as a regular candidate, at the semester final examinations, a student shall be required to have attended at least 70% of the total number of periods of lectures/tutorials/laboratory classes offered during the semester in every course. A student whose attendance falls short of 70% but not below 60% in any course may be allowed to appear at the final examinations as non-collegiate student and he/she shall not be eligible for the award of any scholarship or stipend. A student, appearing the examination under the benefit of this provision shall have to pay in addition to the fees, the requisite fee prescribed by the syndicate for the purpose. Student having less than 60% attendance in any course will not be allowed to appear in the final examinations

of the semester. An attendance report of the students will be prepared by the concerned course teacher and posted for information of the students. The basis of awarding marks for class participation and attendance is shown in the following Table.

Table Distribution of Marks in Attendance

Attendance	Marks (%)	Remarks
90% and above	100	
85% to less than 90%	90	
80% to less than 85%	80	
75% to less than 80%	70	
70% to less than 75%	60	
65% to less than 70%	50	
60% to less than 65%	40	
less than 60%	0	

5. Class Test [Ref. AOFE article no- 16]

For theoretical courses of less than or equal to 2 credits there shall be at least three class tests and at least four class tests for greater than 2 credits in a semester. Previous class test marks will remain valid for the reported/ course improvement student if he/she is unable to appear at class test.

6. The Grading System [Ref. **AOFE** article no-14]

6.1 The letter grade system shall be used to assess the performance of the students as shown in the following Table:

Table-2 Grading System

Marks	Letter Grade (LG)	Grade Point (GP)
80% or above	A+	4.0
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.5
65 to less than 70%	B+	3.25
60% to less than 65%	B	3.0
55% to less than 60%	B-	2.75
50 to less than 55%	C+	2.5
45% to less than 50%	C	2.25
40 to less than 45%	D	2.0
less than 40%	F	0.0
Incomplete	I	0.0

Absence of a candidate in an examination of a course in which he/she ought to have been present will be considered as if the candidate obtained zero marks ('F' grade) in that course.

6.2 A **Grade Point Average (GPA)** shall be calculated for each semester as follows:

$$GPA = \frac{\sum_{i=1}^{n} C_i G_i}{\sum_{i=1}^{n} C_i} \qquad \text{(i)}$$

where, n is the number of courses offered during the semester, C_i is the number of credits allotted to a particular course and G_i is the grade point earned for that course.

6.3 A **Yearly Grade Point Average (YGPA**) shall be calculated for each academic year as follows:

$$YGPA = \frac{\sum_{j=1}^{2} C_j G_j}{\sum_{j=1}^{2} C_j} \qquad \text{(ii)}$$

Where 2 is the number of semesters, C_j is the number of credits allotted to the jth semester and G_j is the GPA earned for that semester.

6.4 The **Cumulative Grade Point Average (CGPA)** gives the cumulative performance of the students from the first year up to the end of the year to which it refers, and will be calculated as follows:

$$CGPA = \frac{\sum_{k=1}^{m} C_k G_k}{\sum_{k=1}^{m} C_k} \qquad \text{(iii)}$$

where, m is the total number of years being considered, C_k is the total number of credits registered during the kth year and G_k is the YGPA earned in that particular year.

6.5 A Cumulative Grade Point Average (CGPA) shall be calculated at the end of each academic year and to be communicated to the students along with the YGPAs. The individual grades of courses obtained by them for the semesters of the academic year will,

however, be communicated at the end of individual semester by the Chairman of the Examination Committee.

6.6 Both YGPA and CGPA will be rounded up to the second place of decimal for reporting. For instance, YGPA=2.212 shall be rounded up as YGPA=2.22.

Illustration: Suppose a student obtained following grade in Part-1 odd semester:

B.Sc(Eng.) Part-I Odd Semester	Credit	Letter Grade	GP
ENG1111	2	C	2.25
MATH1111	3	A+	4
CHEM1111	3	F	0
EEE1111	4	B+	3.25
EEE1121	4	A+	4
EEE1172	1	A-	3.5
EEE1182	3	A	3.75

Therefore, GPA in the odd semester is =

$$\frac{2(2.25)+3(4)+3(0)+4(3.25)+4(4)+1(3.5)+3(3.75)}{2+3+3+4+4+1+3} = 3.0125 \approx 3.02$$

And lets assume that his/her GPA in Part-I Even Semester is = 3.13

Therefore, YGPA of Part-I examination is = $\frac{20(3.02)+20(3.13)}{20+20}$

$$= 3.075 \approx 3.08$$

Similarly assume that, the student's YGPA for the other 3 Parts are the followings.

Semester/year	Credit	YGPA
Part-II	40	3.47
Part-III	40	2.96
Part-IV	40	3.33

Then his/her CGPA of four academic years is

$$= \frac{40(3.08)+40(3.47)+40(2.96)+40(3.33)}{160} = 3.21$$

6.7 **Earned Credit:** The courses in which a student has obtained minimum 'D' in 'Theoretical courses' and 'C' in 'Laboratory courses and Board Viva-voce' or higher grade will be counted as credits

earned by the student. Any course in which a student has obtained 'F' grade will not be counted towards his/her earned credit. 'F' grade will not be counted for GPA calculation but will stay permanently on the Grade sheet and transcripts.

7. Eligibility for Examination (Ref**. AOFE** article no-23)**:**

7.1 A candidate may not be admitted to any semester final examination unless he/she has

- 7.1.1 Submitted application in the prescribed form to the Registrar/Vice-Chancellor for appearing at the examination,
- 7.1.2 Paid the prescribed examination fees, and all outstanding University and Hall dues,
- 7.1.3 Fulfilled the conditions for attendance in class and
- 7.1.4 Been barred by any disciplinary rules.

7.2 On special circumstances the Vice-Chancellor may permit a student to appear at the examination.

7.3 A student whose attendance falls short of 70% but not below 60% in any course as mentioned above may be allowed to appear at the final examinations as a non-collegiate student.

8. Conducting Examination and Rules for Promotion [Ref. **AOFE** article no-15]

8.1 The academic year shall be divided into two semesters each having duration of not less than 11 teaching weeks (details are given in Section 7 of the Ordinance).

8.2 There shall be final examinations conducted by the concerned Examination Committee of the Departments at the end of each semester.

8.3 The results shall be finalized at the end of the even semester of the academic year. A student entering in an odd semester shall automatically move on to the next semester, unless he/she was barred from appearing at the final examinations at the end of the semester. Individual course grades and GPA shall be announced within a date ordinarily not later than three weeks after the end of the semester final examinations.

8.4 Minimum passing grade: The minimum passing grade in a theoretical course will be D and the minimum passing grade in a laboratory/project/field work/in-plant training/workshop/similar Courses (henceforth referred to as laboratory course) and Viva voce will be C.

8.5 Promotion to higher class: In order to be promoted to higher class a student must obtain the following requirements:

i) Yearly Grade Point Average (YGPA) of 2.25 or higher

ii) Credit point loss (F or I Grade) in the theoretical courses not more than 10.

iii) Minimum C grade in the laboratory courses and viva-voce.

8.6 Course Improvement: A promoted student may appear for only theoretical course improvement in the immediate next academic year for maximum 10 credit points to clear his/her F grade or to improve the grades on the courses in which less than B grade (including those of F grade) was obtained in Part-1, Part-2 and Part-3 examinations. In such case, the student has to give his/her choice of course/courses for course improvement in writing. If the student fails to clear his/her F grades in the first attempt, he/she shall get another (last) chance in the immediate next year to clear the F grades. In every case a student has to carry his previous marks on CA. In the case of student's failure to improve his/her course grade at the course improvement examination, the previous grade shall remain valid.

8.7 Course Exemption: Students who fail to be promoted to the next higher class shall be exempted from taking the theoretical and laboratory courses where they obtained grades equal to B or above. These grades would be counted in calculating GPA in the next year's examination results.

8.8 Merit Position: The YGPA obtained by a student in the semester final examinations will be considered for determining the merit position for the award of scholarships, stipends etc.

9. Publication of Results [Ref. **AOFE** article no-17]

9.1 **Award of degree**: In order to qualify for the B.Sc. Engg. degree, a student must have to earn minimum 150 credits and a minimum CGPA of 2.25 within a maximum of six academic years. The result will be published in accordance with merit.

9.2 **Honours**: Candidates for Bachelor degree in engineering will be awarded the degree with Honours if their earned credit is 160 and CGPA is 3.75 or higher.

9.3 **Result Improvement:** A candidate obtaining B.Sc. Engg. within 4 or 5 academic years shall be allowed to improve his/her result, of maximum of 10 credit points (courses less than 'B' grade) of the Part-IV theoretical courses in the immediate next regular examination after publication of his/her result. No improvement shall be allowed for laboratory examinations and Board Viva-voce. If a candidate fails to improve CGPA with the block of new GP in total, the previous results shall remain valid.

9.4 **Readmission and Course Exemption:** If a student fails to obtain the degree within 4 or 5 academic year, he/she will be readmitted in Part-4 and will appear for the exam according to the clause 15.6. Course exemption rules will also be valid according to clause 15.7.

9.5 **Dean's List:** As a recognition of excellent performance, the names of students obtaining a cumulative GPA of 3.75 or above in two regular semesters in each academic year may be published in the Dean's List in the faculty. Students who have received an 'F' grade in any course during any of the two regular semesters will not be considered for Dean's List in that year.

9.6 **Recording of Result:** The transcripts in English will show the course designation, course title, credit, letter grade, grade point of individual courses, YGPA of each year, and finally, CGPA.

Syllabus for Undergraduate Program for B.Sc. Engg. (EEE) Degree

Session: 2016-2017

Distribution of Courses [Ref. AOFE article no- 5 and 6]

Course Type		Marks	Marks (%)	Credits
Humanities		200	5	8
Basic Sciences (with Lab)		625	15.625	25
Basic and Major Engineering		3175	79.375	127
Total		**4000**	**100**	**160**
	(i) Basic Engineering (with Lab)	225	5.625	9
	(ii) Major Engineering	2950	73.75	118
	(a) Theoretical	2150	53.75	86
	(b) Board Viva-Voce	50	1.25	2
	(c) Laboratory	750	18.75	30

Distribution of Marks (as per course types) [Ref. AOFE article no- 6]

1 **Theoretical Courses:**

Continuous Assessment (**CA**)	Class Attendance	10%	30%
	Quizzes/Class Test	20%	
Semester Final Examination			70%
Total			100%

2 **Laboratory**

Class Attendance	10%
Quizzes and Viva-Voce	30%
Practical/Design Work/Report	60%
Total	100%

3 **Project Work/Field Work/Professional Training**

Internal Examiner/Supervisor	30%
External Examiner (Any teacher from the panel of examiners)	30%
Presentation and Oral Examination	40%
	100%

4 **Basis for awarding marks for class participation and attendance:**

Attendance	Marks (%)
90% and above	100
85% to less than 90%	90
80% to less than 85%	80
75% to less than 80%	70
70% to less than 75%	60
65% to less than 70%	50
60% to less than 65%	40
less than 60%	0

Semester Course Plan for B.Sc. Engg. (EEE) Degree
Session: 2016-2017

Department of Electrical and Electronic Engineering will offer the courses to the undergraduate students for B.Sc. Engineering degree (Session 2016-2017), as per the following arrangement.

B.Sc. Engg. Part-I, Odd Semester, Examination 2017

Sl. No	Course Codes	Course Titles	Marks	Contact hours/ week	Credits
1	EEE 1111	Electrical Circuit I	75	3	3
2	EEE 1112	Electrical Circuit I Sessional	25	2	1
3	EEE 1121	Electrical Properties of Materials	75	3	3
4	CSE 1151	Computer Programming	75	3	3
5	CSE 1152	Computer Programming Sessional	50	4	2
6	MATH 1131	Ordinary and Partial Differential Equations	75	3	3
7	CHEM 1131	Chemistry	75	3	3
8	CHEM 1132	Inorganic, Quantitative Analysis Sessional	25	2	1
9	ENG 1111	Technical and Communicative English	50	2	2
Total			**525**	**25**	**21**

B.Sc. Engg. Part-I, Even Semester, Examination 2017

Sl. No	Course Codes	Course Titles	Marks	Contact hours/ week	Credits
1	EEE 1211	Electrical Circuit II	75	3	3
2	EEE 1212	Electrical Circuit II Sessional	25	2	1
3	EEE 1221	Solid State Devices	75	3	3
4	CE 1252	Engineering Drawing	25	2	1
5	PHY 1231	Electricity and Magnetism, Waves and Optics	75	3	3
6	PHY 1232	Physics Sessional	25	2	1
7	MATH 1211	Differential and Integral Calculus	75	3	3
8	STAT 1211	Statistics for Engineers	50	2	2
9	ECON 1211	Economics	50	2	2
Total			**475**	**22**	**19**

B.Sc. Engg. Part-II, Odd Semester, Examination 2018

Sl. No	Course Codes	Course Titles	Marks	Contact hours/ week	Credits
1	EEE 2111	Electronic Circuit I	75	3	3
2	EEE 2112	Electronic Circuit I Sessional	25	2	1
3	EEE 2121	Electrical Machine I	75	3	3
4	EEE 2122	Electrical Machine I Sessional	25	2	1
5	EEE 2132	Electrical Shop Practice	25	2	1
6	ME 2151	Mechanical Engineering	50	2	2
7	ME 2152	Mechanical Engineering Sessional	25	2	1
8	PHY 2121	Mechanics, Modern Physics and Thermal Physics	75	3	3
9	MATH 2131	Complex Variables, Co-ordinate Geometry and Vector Analysis	75	3	3
10	ACCO 2111	Management and Accountancy	50	2	2
Total			**500**	**24**	**20**

B.Sc. Engg. Part-II, Even Semester, Examination 2018

Sl. No	Course Codes	Course Titles	Marks	Contact hours/ week	Credits
1	EEE 2211	Electronic Circuit II	75	3	3
2	EEE 2212	Electronic Circuit II Sessional	25	2	1
3	EEE 2221	Digital Electronics	75	3	3
4	EEE 2222	Digital Electronics Sessional	25	2	1
5	EEE 2231	Computational Methods and Matlab Programming	75	3	3
6	EEE 2232	Computational Methods and Matlab Programming Sessional	25	2	1
7	EEE 2241	Continuous Signals and Linear Systems	75	3	3
8	MATH 2241	Linear Algebra	75	3	3
9	LAW 2211	Law and Professional Ethics	50	2	2
Total			**500**	**23**	**20**

B.Sc. Engg. Part-III, Odd Semester, Examination 2019

Sl. No	Course Codes	Course Titles	Marks	Contact hours/ week	Credits
1	EEE 3111	Power System I	75	3	3
2	EEE 3112	Power System I Sessional	25	2	1
3	EEE 3121	Electronic Circuit III	50	2	2
4	EEE 3122	Electronic Circuit III Sessional	25	2	1
5	EEE 3131	Power Electronics	50	2	2
6	EEE 3132	Power Electronics Sessional	25	2	1
7	EEE 3141	Electrical Machine II	75	3	3
8	EEE 3142	Electrical Machine II Sessional	25	2	1
9	EEE 3151	Microprocessors and Embedded Systems	75	3	3
10	EEE 3152	Microprocessors and Embedded Systems Sessional	25	2	1
11	EEE 3161	Electromagnetic Theory and Antenna	50	2	2
Total			**500**	**25**	**20**

B.Sc. Engg. Part-III, Even Semester, Examination 2019

Sl. No	Course Codes	Course Titles	Marks	Contact hours/ week	Credits
1	EEE 3211	Control System	75	3	3
2	EEE 3212	Control System Sessional	25	2	1
3	EEE 3221	Power System II	50	2	2
4	EEE 3222	Power System II Sessional	25	2	1
5	EEE 3231	Digital Signal Processing	50	2	2
6	EEE 3232	Digital Signal Processing Sessional	25	2	1
7	EEE 3241	Communication Systems I	75	3	3
8	EEE 3242	Communication Systems I Sessional	25	2	1
9	EEE 3251	Measurement and Instrumentation	50	2	2
10	EEE 3252	Measurement and Instrumentation Sessional	25	2	1
11	EEE 3261	Project Planning, Management and Engineering	50	2	2
12	EEE 3272	Electronic Shop Practice	25	2	1
Total			**500**	**26**	**20**

B.Sc. Engg. Part-IV, Odd Semester, Examination 2020

Sl. No	Course Codes	Course Titles	Marks	Contact hours/ week	Credits
1	EEE 4111	Power Plant Engineering and Economy	75	3	3
2	EEE 4121	VLSI Circuits and Design	75	3	3
3	EEE 4122	VLSI Circuits and Design Sessional	25	2	1
4	EEE 4131	Optoelectronics	75	3	3
5	EEE 4141	Communication Systems II	75	3	3
6	EEE 4142	Communication Systems II Sessional	25	2	1
7	Option I (T)	Theory Course should be selected from Table-I	75	3	3
8	Option I (S)	Sessional based on Option I (T)	25	2	1
9	EEE 4182	Industrial Training	25	2	1
10	EEE 4292*	Project	0	2	0
Total			**475**	**23**	**19**

*Project evaluation will be made in the Even Semester.

Table-I: Option I

Course Codes	Course Titles	Marks	Credits
EEE 4151	Computer Networks	75	3
EEE 4252	Computer Networks Sessional	25	1
EEE 4161	High Voltage Engineering	75	3
EEE 4162	High Voltage Engineering Sessional	25	1
EEE 4171	Microwave Engineering and Radar System	75	3
EEE 4172	Microwave Engineering and Radar System Sessional	25	1

B.Sc. Engg. Part-IV, Even Semester, Examination 2020

Sl. No	Course Codes	Course Titles	Marks	Contact hours/ week	Credits
1	EEE 4211	Power System Protection and Switchgear	75	3	3
2	EEE 4212	Power System Protection and Switchgear Sessional	25	2	1
3	EEE 4221	Cellular and Mobile Communication	75	3	3
4	EEE 4222	Cellular and Mobile Communication Sessional	25	2	1
5	EEE 4231	Biomedical Engineering	75	3	3
6	EEE 4232	Biomedical Engineering Sessional	25	2	1
7	Option II (T)	Theory Course should be selected from Table-II	75	3	3
8	EEE 4292	Project	100	8	4
9	EEE 4200	Board Viva-voce	50	-	2
10		Study Tour	-	-	-
Total			**525**	**26**	**21**

Table-II: Option II

Course Codes	Course Titles	Marks	Credits
EEE 4241	Renewable Energy	75	3
EEE4251	Power System Operation and Control	75	3
EEE 4261	Nuclear Power Engineering	75	3
EEE 4271	Processing and Fabrication Technology	75	3
EEE 4281	Compound Semiconductor Devices	75	3

EEE, Session 2016~2017

Details Syllabus for B.Sc. Engg. (EEE) Degree
Session: 2016-2017

B.Sc. Engg. Part-I, Odd Semester, Examination 2017

EEE 1111 Electrical Circuit I

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Circuit Variables and Elements: Voltage, current, power, energy, independent and dependent sources, resistance, inductance and capacitance.

Basic Laws: Ohm's law, Kirchhoff's current and voltage laws.

Simple resistive circuits: Series and parallel resistive circuits and their equivalents, Voltage and current divider circuits, Delta-Wye equivalent circuits.

Techniques of Circuit Analysis: Nodal and mesh analysis including supernode and supermesh. Techniques of General DC Circuit Analysis (containing both independent and dependent sources): Node-voltage method, Mesh-current method, Source transformations. Network theorems: Source transformation, Thevenin's, Norton's and superposition theorems with applications in circuits having independent and dependent sources, Millman's theorem, Compensation theorem, Maximum power transfer theorem and Reciprocity theorem.

Section-B

Energy Storage Elements: Properties of Inductances and capacitances, Series-parallel combinations of inductances and capacitances, Concepts of transient and steady state response with dc source.

Magnetic Quantities and Variables: Field, Flux, Flux Density, Magnetomotive Force, Magnetic Field Strength, permeability and B-H Curve, reluctance, magnetic field strength.

Laws in Magnetic Circuits: Ohm's law and Ampere's circuital law.

Magnetic Circuits: Analysis of series, parallel and series-parallel magnetic circuits. Comparison between electrical and magnetic quantities, Hysteresis and hysteresis loss. Magnetic materials.

Introduction to Measuring Instruments: Ammeter, voltmeter, galvanometer and wattmeter.

Recommended Books:

1. Robert L. Boylestad : Introductory Circuit Analysis
2. Charles K. Alexander and Mathew N. O. Sadiku : Fundamentals of Electric Circuits
3. R. C. Dorf and J. A. Svoboda : Introduction to Electric Circuits
4. J. D. Ryder : Networks, Lines and Fields
5. B. Grob : Basic Electronics
6. J. A. Edminister : Electric Circuits
7. R. Resnick and D. Halliday : Physics, Part-II
8. A.R. Rafiqullah, A.K. Roy and M.S. Haq : Concepts of Electricity and Magnetism
9. Arthur Kip : Fundamentals of Electricity and Magnetism
10. B.L.Theraja : Electrical Technology

EEE 1112 Electrical Circuit I Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 1111.

EEE 1121 Electrical Properties of Materials

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Crystal Structures: Types of crystals, lattice and basis, Bravais lattice and Miller indices. Classical theory of electrical and thermal conduction: Scattering, mobility and resistivity, temperature dependence of metal resistivity, Mathiessen's rule, Hall effect and thermal conductivity. Introduction to quantum mechanics: Wave nature of electrons, Schrodinger's equation, one-dimensional quantum problems- infinite quantum well, potential step and

potential barrier; Heisenbergs's uncertainty principle and quantum box, Electron in a 3D box. Hydrogen Atom.

Band Theory of Solids: Band theory from molecular orbital, Bloch theorem, Kronig-Penny model, Brillouin zone, effective mass, density-of-states. Carrier statistics: Maxwell-Boltzmann and FermiDirac distributions, Fermi energy. Modern theory of metals: Determination of Fermi energy and average energy of electrons, classical and quantum mechanical calculation of specific heat.

Section-B

Dielectric Properties of Materials: Dielectric constant, polarization- electronic, ionic, orientational and interfacial; internal field, Clausius-Mosotti equation, spontaneous polarization, frequency dependence of dielectric constant, dielectric loss, piezoelectricity, ferroelectricity, pyroelectricity.

Magnetic Properties of Materials: Magnetic moment, magnetization and relative permitivity, different types of magnetic materials, origin of ferromagnetism and magnetic domains.

Introduction to Superconductivity: Zero resistance and Meissner effect, Type I and Type II superconductors and critical current density. BCS theory. Magnetic recording materials, Josephson theory.

Introduction to meta-materials.

Books Recommended:

1. C. Kittel : Introduction to Solid State Physics
2. J. Mckelvy : Solid State and Semiconductor Physics
3. J.C. Anderson, K.D. Leaver, J.M. Alexander and R.D. Rawlings : Materials Science
4. Safa O. Kasap : Principles of Electronic Materials and Devices
5. J. Dekker : Solid State Physics
6. L.J. Azaroff and J.J. Brophy : Electronic Process in Materials
7. C.A. Wert and R.M. Thomson : Physics of Solids
8. Rogers, Pennathur, Adams : Nanotechnology: Understanding Small Systems

CSE 1151 Computer Programming

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Introduction to Computers: Definition, functions and characteristics of computers, block diagram, computer generations, and classification of computer.

Programming Languages, their classifications, basic concept of Assembler, Compiler, interpreter, algorithms and flow charts.

Structured Programming using C: Variables and constants, operators, expressions, control statements, functions, arrays, pointers, structure unions, user defined data types, and input-output file handlings.

Section-B

Object-oriented Programming using C++: introduction, classes and objects; inheritance; constructors and destructors; operator and function overloading; polymorphism; C++ data file-C++ file, stream classes, input and output file, mode of files, file pointer, random file accessing; Template and Exception handling-function template and class template, Exception handling.

Recommended Books:

1. Anita Goel and Ajay Mittal : Computer Fundamentals and Programming in C
2. Pradip Dey, Manas Ghosh : Fundamentals of Computing and Programming in C
3. Byron S Gottfried : Pogramming with C, Schaums Outlines
4. H. Schidt : C++: A Beginner's Guide
5. H. Schidt : C++: The Complete Reference

CSE 1152 Computer Programming Sessional

50 Marks [60% Practical/Design Work/ Report, 30% Quizzes/
Viva-Voce, 10% Attendance]
Credits: 2, Contact hours/week: 4

Sessional based on the theory of course CSE 1151.

MATH 1131 Ordinary and Partial Differential Equations

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Ordinary Differential Equations: Degree and order of ordinary differential equations, formation of differential equations. Solution of first order differential equations by various methods. Solution of general linear equations of second and higher orders with constant coefficients. Solution of homogeneous linear equations. Solution of differential equations of the higher order when the dependent or independent variables are absent. Solution of differential equation by the method based on the factorization of the operators.

Section-B

Partial Differential Equations: Introduction. Linear and non-linear first order equations. Standard forms. Linear equations of higher order. Equations of the second order with variable coefficients. Wave equations. Particular solution with boundary and initial conditions.

Series Solution: Solution of differential equations in series by the method of Frobenious, Bessel's functions, Legendre's polynomials and their properties.

Books Recommended:

1 M. L. Khanna : Matrices
2. Shepley L. Ross : Introduction of Ordinary Differential Equations
3. Frank Ayres : Differential Equations
4. B. D. Sharma : Differential Equations
5. Louis Albert Pipes : Applied Mathematics For Engineers and Physicist
6. Ivar Stephen Sokolnikoff and Raymond M. Redheffer : Mathematics For Physics and Modern Physics

CHEM 1131 Chemistry

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Atomic Structure, Quantum numbers, Electronic configuration, Periodic table, Properties and uses of noble gases, Different types of chemical bonds and their properties, Molecular structure of compounds, , Modern concept of acid and bases, Problems involving acid base titration, Selective organic reactions.

Section-B

Different types of solutions and their compositions, Phase rule, Phase diagram of monocomponent system, Properties of dilute solutions, Thermochemistry, Chemical Kinetics, Chemical Equilibria, Ionization of water and pH concept, Electrical properties of solution.

Books Recommended:

1. R. D. Madan : Modern Inorganic Chemistry
2. M.M. Haque and M.A. Nawab : Principles of Physical Chemistry
3. E.S Gilreath : Fundamental Concepts in Inorganic Chemistry
4. G.M. Barrow : Physical Chemistry
5. W.J.Moore : Physical Chemistry
6. K.J. Laidler and J.H. Meiser : Physical Chemistry
7. S.R. Palit : Elementary Physical Chemistry
8. S. Z. Haider : Modern Inorganic Chemistry
9. Audrey L. Companion : Chemical Bonding
10. F. Albert Cotton, Geoffry Wilkinson , Paul L. Gaus : Basic Inorganic Chemistry
11. Donald K. Sebera : Electronic Structure and Chemical Bonding

CHEM 1132 Inorganic, Quantitative Analysis Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/
Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Volumetric Analysis: Acid-base titration, oxidation-reduction titrations, determination of Fe, Cu and Ca volumetrically.

ENG 1111 Technical and Communicative English

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six
taking not more than Two from each section)

Section-A

Grammar: Grammatical principles, modals, phrases and idioms, prefixes and suffixes, sentence structures, wh and yes/ no questions, conditional sentences.

Vocabulary: Technical and scientific vocabulary, defining terms.

Spoken English: Introduction to phonetic symbols, dialogue, responding to particular situations, extempore speech.

Section-B

Reading: Comprehension of technical and non-technical materials-skimming, scanning, inferring and responding to context.

Technical Writing: Paragraph and composition writing on scientific and other themes, report writing, research paper writing, library references.

Professional Communication: Business commercial correspondence letter, job application, memos, quotations, tender notice, amplification, description, technical report writing, standard forms of term papers, thesis etc.

Books Recommended:

1. John M. Lennon : Technical Writing
2. A.J. Thomson and A.V. Martinet : A Practical English Grammar
3. A. Ashley : Oxford Handbook of Commercial Correspondence
4. J. Swales : Writing Scientific English
5. Robert J. Dixson : Complete Course in English
6. Rajendra Pal and J. S. Korlahalli : Essentials of Business Communications.

B.Sc. Engg. Part-I, Even Semester, Examination 2017

EEE 1211 Electrical Circuit II

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Power Source Concept: Source of e.m.f, ideal and practical sources.

Sinusoidal Functions: Instantaneous current, voltage, power, effective current and voltage, average power, phasors and complex quantities, impedance, admittance, reactance, susceptance, real and reactive power, power factor. Definitions of ac voltage, current, power, volt-ampere and various factors (including power, peak, form factors etc.)

Analysis of Single Phase AC Circuits: Series and parallel RL, RC and RLC circuits, nodal and mesh analysis, application of network theorems in AC circuit analysis, circuits with non-sinusoidal excitations, power and power factor of ac circuits with multiple sources of different frequencies, transients in AC circuits.

Section-B

Passive Filter Networks: Properties of symmetrical networks, Characteristic impedance and attenuation, ladder network, Filter fundamentals, different types of filters, propagation coefficient and time delay in filter sections, practical composite filters, Constant-K filter, design considerations.

Resonance in AC Circuits: Series resonance, Parallel Resonance, Q-value and Bandwidth.

Magnetically Coupled Circuits.

Analysis of Three Phase Circuits: Three phase supply, balanced and unbalanced circuits, power calculation.

Books Recommended:

1 Robert L. Boylestad : Introductory Circuit Analysis
2 Charles K. Alexander and Mathew N. O. Sadiku : Fundamentals of Electric Circuits
3 R. C. Dorf and J. A. Svoboda : Introduction to Electric Circuits
4 J. D. Ryder : Networks, Lines and Fields
5 B. Grob : Basic Electronics
6 J. A. Edminister : Electric Circuits

7 R. Resnick and D. Halliday : Physics, Part-II
8 A.R. Rafiqullah, A.K. Roy and M.S. Haq : Concepts of Electricity and Magnetism
9 Arthur Kip : Fundamentals of Electricity and Magnetism
10 B.L.Theraja : Electrical Technology

EEE 1212 Electrical Circuit II Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of Course EEE 1211.

EEE 1221 Solid State Devices

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Semiconductors in Equilibrium: Energy bands, intrinsic and extrinsic semiconductors, Fermi levels, electron and hole concentrations, temperature dependence of carrier concentrations and invariance of Fermi level.

Carrier Transport Processes and Excess Carriers: Drift and diffusion, generation and recombination of excess carriers, built-in-field, recombination-generation SRH formula, surface recombination, Einstein relations, continuity and diffusion equations for holes and electrons and quasi-Fermi level.

PN Junction: Basic structure, equilibrium conditions, contact potential, equilibrium Fermi level, space charge, non-equilibrium condition, forward and reverse bias, carrier injection, minority and majority carrier currents, transient and AC conditions, time variation of stored charge, reverse recovery transient and capacitance.

Section-B

Bipolar Junction Transistor: Basic principle of pnp and npn transistors, emitter efficiency, base transport factor and current gain, diffusion equation in the base, terminal currents, coupled-diode model

and charge control analysis, Ebers-Moll model and circuit synthesis. BJT non-ideal effects; Hetero-junction transistors.

Metal-semiconductor Junction: Energy band diagram of metal semiconductor junctions, rectifying and ohmic contacts.

MOS Structure: MOS capacitor, energy band diagrams and flat band voltage, threshold voltage and control of threshold voltage, static CV characteristics, qualitative theory of MOSFET operation, body effect and current-voltage relationship of a MOSFET. Non-ideal characteristics of MOSFET: channel-length modulation and short channel effects in MOSFETs. MOS scaling.

Introduction to Multigate FET Architecture: Double gate MOSFET, FinFET, Surrounding gate FET, high-K dielectric FETs.

Books Recommended:

1. Benjamin G. Streetman : Solid State Electronic Devices
2. S.M. Sze and Kwok K. Ng : Physics of Semiconductor Devices
3. Jasprit Singh : Semiconductor Devices: Basic Principles
4. K. Hess : Advanced Theory of Semiconductor Devices
5. Chih-Tang Sah Fundamentals of Solid State Electronics

CE 1252 Engineering Drawing

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Introduction, Orthographic projections, Sectional Views, isometric views, Pictorial views, Drawing standards and practices, Interpenetrating of surfaces, Development of surfaces, Machine drawings, Technical sketching, Introduction to computer aided design (CAD).

Books Recommended:

1. F.E.Giesecke, A. Mitchell, H. C. Spencer, I. L. Hill, R. O. Loving and J. T. Dygdon : Engineering Graphics
2. F. Zozzora : Engineering Drawing
3. R.S. Rhodes and L.B. Cook : Basic Engineering Drawing
4. Jan A. Van Der Westhuizen Drawing for Civil Engineering

PHY 1231 Electricity and Magnetism, Waves and Optics

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Electricity and Magnetism:

Static Electric Field: Postulates of electrostatics, Coulomb's law for discrete and continuously distributed charges, Gauss's law and its application, electric potential due to charge distribution, conductors and dielectrics in static electric field, flux density- boundary conditions; capacitance- electrostatic energy and forces, energy in terms of field equations, capacitance calculation of different geometries; boundary value problems- Poisson's and Laplace's equations in different co-ordinate systems.

Static Magnetic Field: Postulates of magnetostatics, Biot-Savart's law, Ampere's law and applications, vector magnetic potential, magnetic dipole, magnetization, magnetic field intensity and relative permeability, boundary conditions for magnetic field, magnetic energy, magnetic force on a charge, Lorentz force, torque and inductance of different geometries.

Electromagnetic Induction: Faraday's law of electromagnetic induction, Lenz's law, induced current and voltage, energy stored in a magnetic field.

Thermoelectricity: Thermal electromotive forces, Seebeck effect and Peltier effect, laws of addition of thermal electromotive forces, thermoelectric equations and power, practical thermocouple, Illumination laws, various kinds of lamps.

Section-B

Waves:

Differential equation of simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, spring mass system, torsional pendulum; two body oscillation, reduced mass, damped oscillation, forced oscillation, resonance, progressive wave, power and intensity of wave, stationary wave, group and phase velocities.

Optics:

Defects of Images: Spherical aberration, astigmatism, coma, distortion, curvature, chromatic aberration. Theories of light;

Interference of Light: Young's double slit experiment, displacement of fringes and its uses, Fresnel bi-prism, interference in thin films, Newton's rings, interferometers; Diffraction: Diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit and N-slits, diffraction grating; Polarization: Production and analysis of polarized light, Brewster's law, Malus law, polarization by double refraction, Nicol prism, optical activity, Polarimeters. Eelctro-magneto Optics: Zeeman effect, Faraday effect, Cotton-Mouton effect, Kerr Magneto-optic effect, Kerr electro-optic effect.

Books Recommended:

1. David Halliday and Robert Resnick : Physics Part I and Part II
2. A. Beiser : Concept of Modern Physics
3. Francis A. Jenkins and Harvey E. White : Textbook of Optics
4. Brij Lal : A Textbook of Optics
5. Edward M. Purcell : Electricity and Magnetism
6. Stanley Ramsey : Electricity and Magnetism
7. Richard Fitzpatrick : Oscillations and Waves: An Introduction
8. R.A. Waldron : Waves and Oscillations

PHY 1232 Physics Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of the course PHY 1231.

MATH 1211 Differential and Integral Calculus

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Functions: Domain, Range, Inverse function and graphs of functions, Limits, Continuity, Indeterminate form.

Ordinary Differentiation: Differentiability, Differentiation, Successive differentiation and Leibnitz theorem.

Expansions of Functions: Rolle's theorem, Mean value theorem, Taylor's and Maclaurin's formulae.

Maximum and minimum of functions of one variable.

Partial Differentiation: Euler's theorem, Tangents and normal.

Asymptotes.

Section-B

Indefinite Integrals: Method of substitution, Integration by parts, Special trigonometric functions and rational fractions.

Definite Integrals: Fundamental theorem, General properties, Evaluations of definite integrals and reduction formulas.

Multiple Integrals: Determination of lengths, Areas and Volumes.

Books Recommended:

1. B.C. Das and B.N.Mukherjee : Differential Calculus
2. B.C.Das and B.N. Mukherjee : Integral Calculus
3. Joseph Edwards : Differential Calculus
4. Benjamin Williamson : Integral Calculus
5. Muhammad and Bhattacherjee : Differential Calculus
6. Muhammad and Bhattacherjee : Integral Calculus

STAT 1211 Statistics for Engineers

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six
taking not more than Two from each section)

Section-A

Analysis of Statistical Data: Location, Dispersion and their measures, Skewness, Kurtosis and their measures, Moment and Cumulants and Practical examples.

Probability: Concept of probability, Sample Space, Events union and Intersection of Events. Probability of events, Loss of probability, Conditional probabilities. Bay's Theorem, Chebysec's Inequality and Practical examples.

Random Variables and Probability Distribution: Basic concepts, Discrete and continuous random variables, Density and distributional functions, Mathematical expectation and variance, Joint marginal and conditional density functions. Conditional Expectation and conditional variance. Moments and Cumulant generating functions. Characteristic function. Study of Binomial Poisson, Normal and Bivariate Normal distribution and Practical examples.

Section-B

Linear Regression: Correlation, Rank correlation. Partial and Multiple correlations Linear Regression for two Variables, Principle of Least Squares Method, Lines of best fit, Residual Analysis and examples.

Test of Significance: Basic ideas of Null hypothesis, Alternative hypothesis, Type-I error Type-II error level of significance Degree of freedom, Rejection region and Acceptance region. Test of Single mean, Single variance, Two sample means and Variances. Test for 2×2 contingency tables, Independence test and practical examples. Application in quality control, failure pattern, depreciation calculation.

Books Recommended:

1. P.G.Hoel : Introductory Statistics
2. S.G. Gupta : Fundamentals of Statistics
3. A. J. B. Anderson : Interpreting Data
4. H. Cramer : The Elements of Probability Theory
5. D. V. Lindley : Introduction to Probability and Statistics
6. S. Lipschutz : Probability

ECON 1211 Economics

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six
taking not more than Two from each section)

Section-A

Basic Concepts of Economics: Definition and subject matter of Economics; Microeconomics vs macroeconomics; Law of Economics; Central economic problems of every society; Different economic systems; Economics and Engineering.

Theory of Demand, Supply and Consumer Behavior: Law of Demand; Demand schedule and demand curve; Supply law, supply schedule and supply curve; Shift in demand and supply; Equilibrium in the market; Elasticity of demand and supply; Marshallian utility analysis; Total and marginal utility; Law of diminishing marginal utility; Law of equi-marginal utility.

Theory of Production and Costs: Meaning of production; factors of production; Production possibility frontier; Law of variable proportion; Returns to scale; isoquants; Concepts of total, average and marginal costs, fixed and variable costs; Isocost curve; Least cost combinations of factors.

Theory of the Firm: Perfect competition and monopoly; Total, average and marginal revenue of a firm; Average and marginal revenue under perfect competition and monopoly; Firm's Equilibrium; Equilibrium of firm under perfect competition and monopoly.

Section-B

Linear Programming and Input-Output Analysis: Meaning of linear programming; Its components; duality of a problem in linear programming; graphical, feasible and optimal solutions; The simplex method; Meaning of input-output analysis; Input-output analysis model; balance equation; coefficient matrix; Determination of final demand vector.

Basic Concepts of Macroeconomics: Growth; Unemployment; Inflation; Philips Curve, Business cycle; Circular flow of economics; Two, three and four sector economics.

National Income Accounting and Determination: Concepts of GNP, GDP and national income; Methods of national income accounting; problems of national income accounting; Keynesian model of national income determination; The multiplier; Effect of fiscal policy in the Keynesian model.

Development Planning in Bangladesh: Need for planning in Bangladesh; Various five year plans in Bangladesh; Development strategies in the five year plans of Bangladesh.

Books Recommended:

1. Semuelson and Nordhous : Economics
2. Byrons and Stone : Economics
3. Dewett, K. K. : Modern Economic Theory
4. Ahuja, H. L : Advanced Economic Theory
5. Government of Bangladesh : Various Five Year Plans

B.Sc. Engg. Part-II, Odd Semester, Examination 2018

EEE 2111 Electronic Circuit I

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Introduction to Semiconductors: History of vacuum tube and modern electronics, Intrinsic and extrinsic semiconductors-carriers, energy bands, Fermi level, charge neutrality; carrier drift, mobility and diffusion, carrier generation and recombination.

Semiconductor Diodes and Diode Circuits: P-N junction diodes-formation, I-V characteristics and applications; ideal diode, diode circuits: dc analysis and models, diode circuits: AC equivalent circuits, rectifiers, clipper and clamper circuits, other diode types: Zener diode, Varactor diode, photo diodes and LED, their characteristics and applications. Zener diode circuits, Regulators and DC power supply.

Bipolar Junction Transistor (BJT): BJT-PNP and NPN type, CE, CB and CC configurations, action, characteristics; DC analysis of BJT circuits, basic transistor applications, biasing techniques, bias stability, bias compensation, operating point, load line.

Section-B

BJT Amplifiers: Concept of amplification, basic configurations, CE amplifiers, CC and CB amplifier, AC load lines, small signal operation, Amplifiers with passive and active loads, loading effect, coupling methods, multistage amplifiers, Emitter Follower, Darlington pair, power consideration . Small signal low frequency amplifiers-transistor equivalent circuits, hybrid parameters, analysis of CE, CB and CC amplifiers using h-parameters. Analysis of multistage amplifier using hybrid model, Large Signal model and compact model for BJT.

Field-Effect Transistors: JFET and MOSFET – construction, classification, principle of operation, I-V characteristics, parameters, effect of temperature, applications. Channel conductivity, DC circuit analysis, Biasing, constant current biasing, bias stabilization and compensation.

FET Amplifier: Basic configurations-Common-Source, Common-Gate Stage, Source Follower (common drain); single stage integrated

circuit FET amplifiers, multistage amplifiers, basic JFET amplifiers; frequency response of FET. Large and small signal models, compact models for FET, Amplifiers with passive and active loads.

Power Amplifiers: Power amplifiers, power transistors, classification, collector efficiency, classes of amplifiers, Class-A, class-B, class-C power amplifier, Class-AB push pull complimentary output stage.

Books Recommended:

1. J. Millman and C.C. Halkias : Electronic Devices and Circuits
2. Donald A. Neamen : Semiconductor Physics and Devices
3. Albert P. Malvino and David J. Bates : Electronic Principles
4. B.L.Theraja : Electrical Technology
5. S.L. Gupta and V. Kumar : Handbook of Electronics
6. Robert Boylestad and Louis : Electronic Devices and Circuits
7. B. Grob : Basic Electronics
8. B.G. Streetman : Solid State Electronic Devices
9. G.K. Mithal : Industrial Electronics
10. Faruki and Maskara : Basic Electronics
11. V.K. Mehta : Principles of Electronics

EEE 2112 Electronic Circuit 1 Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 2111.

EEE 2121 Electrical Machine I

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Single Phase Transformer: Principles, Types, Equivalent circuits, Performance and testing, Regulation, Losses and efficiency, Parallel operation, Auto-transformer, Instrument transformers.

Poly Phase Transformer: Poly phase transformer construction, Poly phase transformer connections, Harmonics in polyphase transformer, transformer cooling.

Section-B

Polyphases Induction Motor: Principle of operation, Constructional details, Classifications, Equivalent circuits, Starting torque and maximum torque, Speed-torque relations, Losses and efficiency, Circle diagram, Starters, Methods of speed control, Methods of braking and plugging, Induction generator.

Single Phase Induction Motor: Principle, Construction and types, Performance, Double revolving field theory, Cross field theory, Equivalent circuits.

Books Recommended:

1. A Fitzgerald : Electric Machinery
2. Syed A. Nasar : Schaum's Outline of Electric Machines and Electromechanics
3. Firewall Media : A Text Book of Electrical Machines
4. Er. R.K. Rajput : Electrical Machines in S.I.UNITS
5. J.B.Gupta : Electrical Machines (AC and DC Machines)
6. M.A.Salam : Fundamentals of Electrical Machines
7. Charles A. Gross : Electric Machines
8. Stephen J. Chapman Electric Machinery Fundamentals
9. Theodore Wildi Electrical Machines, Drives, and Power Systems
10. Charles I Hubert Electric Machines: Theory, Operating Applications, and Controls
11. Stephen J. Chapman Electric Machinery and Power System Fundamentals

EEE 2122 Electrical Machine I Sessionl

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 2121.

EEE 2132 Electrical Shop Practice

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Electrician's tools, splices, soldering, code practices, Electrical and electronic symbols, Safety rules, electricity rules and electricity codes, Electrical wiring system design, drawing and estimation for residential and commercial house wiring and industrial installation wiring. Use of meggers, Insulation test, Grounding earth resistance measurement using earth resistance tester. Battery charging.

Books Recommended:

1. Neil Sclater : Handbook of Electrical Design Details
2. R P Singh : Electrical Workshop: A Textbook
3. Mohamed A. El-Sharkawi : Electric Safety: Practice and Standards
4. John E. Traister : Handbook of Electrical Design Details

ME 2151 Mechanical Engineering

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

Study of fuels. Steam generation units with accessories and mountings. Study of steam generation and steam turbines. Introduction to internal combustion engines and their cycles. Study of SI and CI engines and gas turbines with their accessories.

Refrigeration and Air-conditioning with their application. Refrigeration equipment: compressors, condensers and evaporators.

Section-B

Type of fluid machinery, Study of impulse and reaction turbine. Pelton wheel and Kalpan turbine. Study of centrifugal and axial flow machines. Pumps, fans, blowers and compressors. Study of reciprocation pumps.

Books Recommended:

1. Terrell Croft : Steam-turbine Principles and Practice
2. T. Al-Shemmeri : Wind Turbines
3. Joseph M. Powers : Fundamentals of Combustion
4. Buddhi N. Hewakandamby : A First Course in Fluid Mechanics for Engineers
5. Daniel Micallef : Fundamentals of refrigeration thermodynamics
6. Shan K. Wang : Handbook of Air Conditioning and Refrigeration
7. G.F. Hundy, A.R. Trott and T.C. Welch : Refrigeration and Air-Conditioning
8. P. Shlyakhin : Steam Turbines: Theory and Design

ME 2152 Mechanical Engineering Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based the theory of course ME 2151.

PHY 2121 Mechanics, Modern Physics and Thermal Physics

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Mechanics:

Linear momentum of a particle, Linear momentum of a system of particles, conservative and non-conservative forces, Conservation of linear momentum, Some applications of the momentum principle; Angular momentum of a particle, Angular momentum of a system of particles, escape velocity, Kepler's Law of planetary motion, The Law of universal gravitation, The motion of planets and satellites, Introductory quantum mechanics: limitation of classical mechanics, postulates of quantum mechanics, linear operators, wave functions, Eigen values, Eigen functions, time dependent and time independent Schrödinger's equations, particle in a box, reflection and transmission by a barrier, tunnel effect; Wave function, Uncertainty principle and its applications, Expectation value. Linear harmonic oscillator- the annihilation and creation operators, Schrödinger equation of hydrogen atom, the quantum number and selection rules, radioactive transition and Zeeman Effect.

Section-B

Modern Physics:

Galilean relativity and Einstein's special theory of relativity; Lorentz transformation equations, Length contraction, Time dilation and mass-energy relation, Photoelectric effect, Compton effect; de Broglie matter waves and its success in explaining Bohr's theory, wave equations, phase and group velocities, Pauli's exclusion principle and its application, Constituent of atomic nucleus, Nuclear binding energy, Different types of radioactivity, Radioactive decay Law; Nuclear reactions, Nuclear fission, Nuclear fusion, Atomic power plant. Atomic Physics: Rutherford model of the atom, electron orbits, atomic spectra, the Bohr atom, the energy levels and spectra, Nuclear motion, atomic excitation.

Thermal Physics:

Heat and work- thermodynamic system, the first law of thermodynamics and its applications; Kinetic Theory of gases- Kinetic interpretation of temperature, specific heats of ideal gases, equipartition of energy, mean free path, Maxwell's distribution of molecular speeds, reversible and irreversible processes, Carnot's cycle, second law thermodynamics, Carnot's theorem, entropy, Thermodynamic functions, Maxwell relations, Clausius and Clapeyron equation. Statistical Mechanics: Statistical distributions, quantum statistics, Maxwell-Boltzmann statistics, Fermi-Dirac statistics, Bose-Eienstein statistics.

Books Recommended:

1. F.W. Sears and G.L. Salinger : Thermodynamics, Kinetic Theory and Statistical Thermodynamics
2. A. Beiser : Concept of Modern Physics
3. F.W. Sears : Thermodynamics
4. D. Elwell and A.J. Pointon : Classical Thermodynamics
5. S.D. Mathur Mechanics
6. R. Resnik and D. Halliday : Physics Part-I and II
7. C.W. Sherwin : Introduction to Quantum Mechanics
8. P.T. Mathews : Introduction to Quantum Mechanics
9. K. Ziock : Basic Quantum Mechanics

MATH 2131 Complex Variables, Co-ordinate Geometry and Vector Analysis

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Complex Variable:

Complex number system. General functions of a complex variable. Limits and continuity of a function of complex variable and related theorems. Complex differentiation and the Cauchy-Riemann equations. Infinite series. Convergence and uniform convergence. Line integral of a complex function. Cauchy's integral formula. Liouville's theorem. Taylor's and Laurent's theorem. Singular points. Residue. Cauchy's residue theorem.

Section-B

Co-ordinte Geometry:

Co-ordinate geometry of three dimension-System of co-ordinates, transformation of co-ordinates, distance between two points, section formula, projection, direction cosines, equations of planes and lines, sphere, cylinder and cone. The general equations of second degree and reduction to standard forms. Identification of conicoids.

Vector Analysis:

Multiple product of vectors. Linear dependence and independence of vectors. Differentiation and integration of vectors together with elementary applications. Line, surface, and volume integrals. Gradient of a scalar function, divergence and curl of a vector function, various formulae. Integral forms of gradient, divergence and curl. Divergence theorem. Stoke's theorem, Green's theorem and Gauss's theorem.

Books Recommended:

1. M. R. Spiezel : Vector Analysis
2. M. A. Sattar : Vector Analysis
3. J. B. Conway : Functions of one complex variable
4. L. V. Ahlfors : Complex Analysis
5. D. Sarason : Notes on complex function theory
6. S.L. Loney : Analytic Coordinate Geometry
7. J.T. Bell : A Treatise on Three Dimensional Geometry
8. C. Smith : An Elementary Treatse on Solid Geometry

ACCO 2111 Management and Accountancy

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six
taking not more than Two from each section)

Section-A

Industry: Types of Industry, Commerce – Hindrance removed by Commerce, Business Environment.

Sole Proprietorships: Features, Advantages, Disadvantages of Sole Proprietorship, Sustainability of Sole proprietorships.

Partnership: Features, Advantages, Disadvantages, the Partnership Contract.

Joint Stock Company: Characteristics, Advantages, Disadvantages, Types, Comparison between Public and Private Ltd Company and Formation of company.

Fundamentals of Management: What is management? Management Function, Levels of Management, Management roles, Core Management skills, Principles of Management.

Organizing the Business: Formal and Informal Organization, Centralisation and Decentralization, Principles of Organizing, Functional Structure, Product Structure, Terrestrial Structure, Matrix Structure, Multiple Structure.

Section-B

Accountings: History, Scope and Nature of Accounting, Information and Uses.

Transaction: Meaning and Features, Double entry System, Characteristics, Account Meaning, Classification, Rules for Determining Debit and Credit, Accounting. Equation, Accounting cycle.

Journal: Meaning, Features, Necessity, Types, Practical Problems.

Ledger: Definition, Advantages, Classification, Rules, Practical Problems.

Cash book: Features, Advantages, Double and Triple Column Cash Book, Discount.

Trial Balance: Meaning, Characteristics, Objects, Practical problems, Preparation of Financial Statements.

Books Recommended:

1. M. C. Shukla : Business organization and management
2. Harold Koontz and Heinz Weihrich : Management
3. Weygandt, Kimmel and Kieso : Accounting Principles
4. Basu and Das : Practice in Accountancy
5. Khan and Arif : Essential of Business Organization and Management
6. May and Baker : Introduction to Business
7. W. H. Newman : Administrative Action
8. Ricky W. Griffin : Management
9. Hermanson and Associates : Accounting Principles
10. Khan and Arif : Fundamental of Operations Management

B.Sc. Engg. Part-II, Even Semester, Examination 2018

EEE 2211 Electronic Circuit II

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Frequency Response of Amplifiers: Techniques of determining 3 dB frequencies of amplifier circuits, frequency response of single-stage and multistage amplifiers, low frequency response of R-C coupled and transformer coupled amplifiers, high frequency model for CE amplifier, CE short circuit current gain, high frequency response with resistive load, low and high frequency response of cascaded CE stages, transformer coupled amplifier, bandwidth, transistor noises.

Feedback and Stability: Basic feedback concept, positive and negative feedback, feedback topologies: voltage (series-shunt) amplifiers, current (shunt-series) amplifiers, transconductance (serie-series) amplifiers, transresistance (shuntshunt) amplifiers, effect of feedback on impedance, gain, bandwidth, distortion and stabilization. frequency compensation.

Oscillators: Condition of oscillation, classification, sinusoidal oscillators-RC phase shift oscillator, Wein bridge oscillator, Resonant circuit oscillators, and Crystal oscillator; Nonsinusoidal oscillators/Multivibrators: Introduction, Monostable, Biastable, Astable and other forms of multivibrator, Uses of multivibrator.

Introduction to CMOS and its applications, Introduction to BiCMOS technology, Large and small signal models, compact models for BiCMOS.

Operational Amplifiers: Ideal operational amplifier and OP-AMP circuits; Differential vs. common mode operations, differential and common mode voltages, common mode rejection ratio (CMRR), OP-AMP applications: inverting amplifier, non-inverting amplifier, summing amplifier, differential amplifier, logarithmic amplifier, operational transconductance amplifiers exponential amplifier, differentiator, integrator, voltage to current converter, voltage follower, and other applications; Non-ideality of op-amp: Non-ideal op-amp characteristics and its effects.

Section-B

Integrated Circuit Biasing and Active Loads: Internal structure of IC OP-AMPs, BJT current sources, FET current sources /sinks, small

signal analysis of active loads, design applications: an NMOS current source; differential and multistage amplifiers: BJT differential amplifier, FET differential amplifier, differential amplifier with active load, BiCMOS circuits, gain stage and simple output stage, BJT operational amplifier circuit, small signal analysis and frequency response of differential amplifiers.

Applications and Design of Integrated Circuits: Active filter-types, low-pass and high pass first order and second order Butter worth filter, higher order filters, bandpass and band rejected filters, all pass filters; Oscillators, Nonsinusoidal oscillators, Voltage Comparators-ideal comparator, differential comparator, Schmitt trigger Circuits, IC comparator; timing circuits, integrated power amplifier, voltage regulator, Design application: An active Bandpass filter. Analog IC Design: Bipolar, MOS and BiCMOS IC technology and its impact, eggshell analogy, application areas and the future of analog IC design.

555 Timer IC and its Applications.

Noises in IC: Origin of internally developed noises in ICs; shot, thermal, flicker, burst and avalanche noises in a device. Representation of noises in circuits, noises in single stage and differential amplifiers, noise bandwidth.

Books Recommended:

1. J. Millman and C.C. Halkias : Electronic Devices and Circuits
2. Donald A. Neamen : Semiconductor Physics and Devices
3. Albert P. Malvino and David J. Bates : Electronic Principles
4. B.L.Theraja : Electrical Technology
5. S. L. Gupta and V. Kumar : Handbook of Electronics
6. Robert Boylestad and Louis : Electronic Devices and Circuits
7. B. Grob : Basic Electronics
8. B.G. Streetman : Solid State Electronic Devices
9. Robert F. Coughlin : Operational Amplifier and Linear Integrated Circuits
10. Allen Mottershead : Electronic Devices and Circuits
11. David A. Bell : Electronic Devices and Circuits
12. M. Cirovic : Basic Electronics and Devices
14. W.D. Cooper : Electronic Instrumentation and Measurement Technique
16. Faruki and Maskara : Basic Electronics
17. V.K. Mehta : Principles of Electronics

EEE 2212 Electronic Circuit II Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 2211.

EEE 2221 Digital Electronics

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Introduction to Number Systems and Codes. Analysis and Synthesis of Digital Logic Circuits: Basic logic functions, Boolean algebra, combinational logic design, minimization of combinational logic. MOSFET Digital circuits: NMOS inverter, CMOS inverter, CMOS logic circuits, Clocked CMOS logic circuits, transmission gates, sequential logic circuits,

Memories: Classification and architecture, RAM memory cells, Read only memory, data converters, BJT digital circuits: ECL, TTL, STTL, BiCMOS, Design application A static ECL gate.

Section-B

Modular Combinational Circuit Design: Pass transistor, pass gates, multiplexer, demultiplexer and their implementation in CMOS, decoder, encoder, comparators, binary arithmetic elements and ALU design.

Sequential Circuits: Different types of latches, flip-flops and their design using ASM approach, timing analysis and power optimization of sequential circuits. Modular sequential logic circuit design: shift registers, counters and their applications. State Machine Design.

Asynchronous and synchronous sequential circuits.

Books Recommended:

1. Thomas L. Floyd : Digital Fundamentals
2. Albert Malvino : Electronic Principles
3. M. Morris Manno : Digital and Computer Design
4. V.K. Jain : Switching Theory and Digital Electronics
5. S.C. Lee : Digital Circuit and Logic Design
6. Tocci and Widmer : Digital Systems

EEE 2222 Digital Electronics Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 2221.

EEE 2231 Computational Methods and Matlab Programming

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Computational Methods: Computer Algorithm, Mathematical modeling of physical systems.

Approximations and Errors: Accuracy and precision, Error definitions, Round-off errors, Truncation errors.

Solution of Algebraic and Trancendental Equations: Bisection method, method of false position, iteration method, Newton-Raphson method, Ramanujan's method.

Interpolation: Newton Gregory forward and backward interpolations, Gauss' central difference interpolation formula, Stirling's interpolation formula, Bessel's formula, Everett's formula, Lagrange interpolation formula, Lagrange inverse interpolation formula, Newton's general interpolation, cubicspline interpolation.

Curve Fitting: Lease square method, cubic spline approximation method.

Numerical Solutions of Linear and Nonlinear Systems of Equations: matrix inversion method, Gauss' elimination method, Gauss-Gordan method, solution of tridiagonal system.

Numerical Differentiation and Integration: Numerical differentiations with different interpolations, Numerical integrations by Trapezoidal rule, Simpson's rules, Boole's and Weiddle rules, Romberg method.

Numerical Solutions of Ordinary Differential Equations: Taylor's series method, Picard method of successive approximations, Euler and modified Euler's method, Preditor-Corrector method, finite difference, shooting method.

Numerical Solutions of Partial Differential Equations: Laplace equation by Jacobi's method, Gauss-Seidel method, SOR method, parabolic and hyperbolic equations by explicit and implicit finite difference technique.

Application of the above techniques in Electrical and Electronic Engineering through computer program.

Section-B

Matlab Programming:

MATLAB Basics: The MATLAB environment, Basic computer programming, Variables and constants, operators and simple calculations, Formulas and functions, MATLAB toolboxes.

Matrices and Vectors: Matrix and linear algebra review, Vectors and matrices in MATLAB, Matrix operations and functions in MATLAB.

Computer Programming: Algorithms and structures, MATLAB scripts and functions (m-files),

Simple sequential algorithms, Control structures (if...then, loops).

MATLAB programming: Reading and writing data, file handling, Personalized functions, Toolbox structure, MATLAB graphic functions.

Numerical Simulations: Numerical methods and simulations, Random number generation, Montecarlo methods

Books Recommended:

1. S.S. Sastry : Introductory Methods of Numerical Analysis
2. Chapra : Numerical Methods for Engineers
3. Kau : Computer Application of Numerical Methods
4. E. Balagurusamy : Numerical Methods
5. Stephen J. Chapman : MATLAB Programming for Engineers
6. Brian R. Hunt : A Guide to MATLAB: For Beginners and Experienced Users
7. Jaan Kiusalaas : Numerical Methods in Engineering with MATLAB
8. Sergey E. Lyshevski : Engineering and Scientific Computations Using MATLAB

EEE 2232 Computational Methods and Matlab Programming Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 2231.

EEE 2241 Continuous Signals and Linear Systems

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Classification of Signals and Systems: Signals- classification, basic operation on signals, elementary signals, representation of signals using impulse function; systems- classification.

Properties of Linear Time Invariant (LTI) Systems: Linearity, causality, time invariance, memory, stability, invertibility.

Time Domain Analysis of LTI Systems: Differential equations-system representation, order of the system, solution techniques, zero state and zero input response, system properties; impulse response-convolution integral, determination of system properties; state variable- basic concept, state equation and time domain solution.

Frequency Domain Analysis of LTI Systems: Fourier series-properties, harmonic representation, system response, frequency response of LTI systems;

Section-B

Fourier Transformation: Properties, system transfer function, system response and distortionless systems.

Applications of Time and Frequency Domain Analyses: Solution of analog electrical and mechanical systems, amplitude modulation and demodulation, time-division and frequency-division multiplexing.

Laplace Transformation: Properties, inverse transform, solution of system equations, system transfer function, system stability and frequency response and application.

Books Recommended:

1. Simon Haykin and Barry Van Veen : Signals and Systems
2. J G Proakis and D G Manolakis : Digital Signal Processing
3. A J Thompson : Digital Signal Processing
4. B. P. Lathi : Signal Processing and Linear Systems
5. Hwei P. Hsu : Schaum's Outline of Signals and Systems

MATH 2241 Linear Algebra

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Vector space, subspace, sum and direct sum, Hilbert Space, Normed Space, Banach Space.

Linear dependence and independence, basis and dimension.

Linear Transformation: Range, kernel, nullity, rank, singular and non-singular transformations.

Matrices and Linear Operators: Matrix representation of a linear operator, Change of basis, similarity, Matrices and linear mapping.

Section-B

Characteristic roots and vectors of linear transformations, theorems and problems; Characteristic and minimum polynomials of square matrices.

Linear functionals and dual vector spaces, Annihilators.

Norms and inner products, Orthogonal complements, orthogonal sets, Gram-schmidt orthogonalization process.

Books Recommended:

1. Seymour Lipschutz, Mark Lipson : Linear Algebra, Schaum's Outline Series
2. L.N. Herstein : Topics in Algebra
3. David C. Lay : Linear Algebra and its Applications
4. Gilbert Strang : Introduction to Linear Algebra
5. Carl. D. Meyer : Matrix Analysis and Applied Linear Algebra
6. Thomas S. Shores : Applied Linear Algebra and Matrix Analysis

LAW 2211 Law and Professional Ethics

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six
taking not more than Two from each section)

Section-A

Law: Principle of law of contract, agency, partnership, sale of goods negotiable instruments, insurance-

Company Law: The companies act with special reference to the amendments and ordinances applicable to Bangladesh. Law regarding formation, Incorporation, Management and winding up of companies.

Labor Law: The scope and sources of labor law. Law in relation to wages, hours, health, safety and other condition to work. The legislation effecting employment in factories. The trade union legislation arbitration, the policy of the state in relation to labor. Elementary principle of labor law. Cyber law, Industrial law etc.

Section-B

History and Development of Engineering Ethics: Study of Ethics in Engineering. Applied Ethics in engineering. Human qualities of an engineer. Obligation of an engineer to the clients and to other engineers. Measures to be taken in order to improve the quality of engineering profession.

Ethical Expectations: Employers and Employees inter-professional relationship, maintaining a commitment of Ethical standards. Desired characteristics of a professional code. Institutionalization of Ethical conduct cyber law moral thoughts.

Books Recommended:

1. A. K. Sen : A Hand Book of Commercial Law
2. A. B.Siddique : The Law of Contract
3. A. A. Khan : Labour and Industrial Law
4. Emile Durkheim : Professional Ethics and Civics Morals
5. J. D. Mabboth : An Introduction to Ethics
6. A. G. Maitra Laws of Contract.
7. Coopers Outline of Industrial Law.
8. A. Zulfiquar A Text Book on the Bangladesh Labour Act-2006.
9. P. Narayanan Intellectual Property Law.
10. A. R. Khan Business Ethics.
11. M. Radar Ethics and the Auman Community.
12. G. E. Moore Principia Ethicia.

B.Sc. Engg. Part-III, Odd Semester, Examination 2019

EEE 3111 Power System I

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Inductance and Capacitance of overhead power line.

Network Representation: Single line and reactance diagram of power system and per unit system.

Line representation: equivalent circuit of short, medium and long lines, reactive power compensation of lines, introduction to DC transmission.

Load Flow Studies: Gauss- Siedel and Newton Raphson methods, Power flow control: Tap changing transformer, phase shifting, booster and regulating transformer and shunt capacitor.

Section-B

Fault Analysis: Transient and subtransient reactance and Short circuit current of a synchronous machine. Symmetrical fault calculation, symmetrical components, sequence impedance and sequence networks of generators, transformers and lines. Different types of unsymmetrical faults: solid faults and faults through impedance. Unsymmetrical fault calculation.

Protection: Fault level calculation, selection of circuit breakers, introduction to relays and circuit breakers. Typical layout of a substation.

Books Recommended:

1. V.K. Mehta and Rohit Mehta : Principles of the Power System
2. Kothari and Nagrath : Power System Engineering
3. M. N. Bandyopadhyay : Electrical Power Systems: Theory And Practice
4. John Grainger, William Stevenson Jr. : Power System Analysis
5. Arthur R. Bergen and Vijay Vittal : Power Systems Analysis
6. Paul M. Anderson, A. A. Fouad : Power System Control and Stability

EEE 3112 Power System I Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/
Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 3111.

EEE 3121 Electronic Circuit III

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six
taking not more than Two from each section)

Section-A

Linear Wave Shaping: RC, RL and RLC circuits. The low pass and high pass RC circuits with sinusoidal, step-voltage, pulse, square wave, exponential and ramp inputs; the high- pass RC circuit as a differentiator, The low-pass RC circuit as an integrator, Attenuator, Ringing circuits, Pulse transformer.

Non-linear Wave Shaping: Introduction, active clippers, clamping circuits, square-wave response of diode clamper, effect of diode cut-in voltage on Clamper.

Solid State Switching Devices: Introduction, Self-operated switching devices-Diode, Externally controlled electrical switches-BJT, JFET, MOSFET, Negative Resistance Devices: general characteristics, classification, two terminal and three terminal Negative resistance devices, tunnel diode, UJT, four-layer diode, SCR, Diac and Triac.

Section-B

Applications of Negative Resistance Devices: Tunnel diode Monostable, astable and bistable multivibrators, UJT astable multivibrator, Tunnel diode comparator, SCR switching and power control, TRIAC full wave ac controller.

Voltage and Current Sweep Generators: Fundamental sweep circuits, methods of ramp generation, Miller integrator circuit, BJT miller integrator, Bootstrap ramp generator, JFET miller ramp generator, current sweep circuit, linearity correction in current sweep generator.

Blocking Oscillators: A triggered transistor blocking oscillator (base-timing and emitter-timing), An astable transistor blocking oscillator (diode-controlled and RC-controlled), Applications.

Books Recommended:

1. Jacob Millman and Herbert Taub : Pulse, Digital and Switching Waveforms
2. A.K. Vanwasi and G.K. Mithal : Pulse and Digital Electronics
3. J.M. Pettit and M.M. McWhorter : Electronic Switching Timing and Pulse Circuits

EEE 3122 Electronic Circuit-III Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 3121.

EEE 3131 Power Electronics

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

Fundamental of power electronics, characteristics of static power semiconductor devices (BJT, MOSFET, IGBT, Thyristors).

AC/DC Power Converters: Uncontrolled rectifiers (single phase and three phase), controlled rectifiers (single phase and three phase), dual converter.

AC/AC Power Converters: Phase controlled converters (single phase and three phase), AC switch, cycloconverter.

Section-B

DC/DC Converters: Choppers (step down and step up), switching regulators (buck, boost, buck-boost).

DC/AC Converters: Types, single phase and three phase inverters. Various applications of converters.

Books Recommended:

1. Muhammad H. Rashid : Power Electronics
2. Mohan, Undeland and Robbins : Power Electronics
3. P. C. Sen : Power Electronics
4. G.K. Mithal : Industrial Electronics

EEE 3132 Power Electronics Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 3131.

EEE 3141 Electrical Machine II

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

D.C. Generator: Principles, Construction, Classification, Armature windings, Voltage build up, Armature reactions and Commutation, Performance and testing, Compounding of d.c. generator, Generator characteristics, Voltage regulation, Losses and efficiency, Parallel operation.

D.C. Motor: Operation, Types, Back e.m.f, Torque equations, Motor characteristics, Speed-Torque Characteristics, Speed regulation, Losses and efficiency, Methods of speed control, Methods of braking, Starters, Amplidyne and Metadyne.

Synchronous Generator: Alternator construction. Armature winding, air gap flux and voltage compensation. Determination of machine parameters. Vector diagram and alternator regulation by different methods. Parallel operation, synchronization. Transient condition of alternator, transient and sub-transient reactances, Blondel's two reaction analysis. Power balance, loss and efficiency.

Section-B

Synchronous Motor: Characteristics operation and vector diagram. Effect of excitation on power factor and motor performance. Application and testing of synchronous motor. Synchronous capacitor and power factor improvements.

Special Machine: Welding machine, Brushless machines, universal motor, stepper motor, reluctance motor, repulsion motor, servomotor, Hysteresis motor, permanent magnet motor and electrostatic motor.

Alternators: Basic principle of operation and operational characteristics, vector diagrams at different loads, synchronous impedance, and synchronous impedance methods of predicting voltage regulation and its limitation. Parallel operation of alternators: necessary condition, synchronizing, circulating current.

Books Recommended:

1.	A Fitzgerald	:	Electric Machinery
2.	Syed A. Nasar	:	Schaum's Outline of Electric Machines and Electromechanics
3.	Firewall Media	:	A Text Book of Electrical Machines
4.	Er. R.K. Rajput	:	Electrical Machines in S.I.UNITS
5.	J.B.Gupta	:	Electrical Machines (AC and DC Machines)
6.	M.A.Salam	:	Fundamentals of Electrical Machines
7.	Charles A. Gross	:	Electric Machines
8.	Stephen J. Chapman	:	Electric Machinery Fundamentals
9.	Theodore Wildi	:	Electrical Machines, Drives, and Power Systems
10.	Charles I Hubert	:	Electric Machines: Theory, Operating Applications, and Controls
11.	Stephen J. Chapman	:	Electric Machinery and Power System Fundamentals
12.	A. Puchstein, T E Loyd and AG Conard	:	Alternating Current Machines

EEE 3142 Electrical Machine II Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 3141.

EEE 3151 Microprocessors and Embedded Systems

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Basic Components of a Computer System. Simple-As-Possible (SAP) Computer: SAP-1, selected concepts from SAP-2 and SAP-3 (jump, call, return, stack, push and pop). Evolution of microprocessors, microprocessor architecture and operation.

Introduction to Intel 8086 Microprocessor: Features, architecture, Minimum mode operation of 8086 microprocessor: system timing diagrams of read and write cycles, memory banks, design of decoders for RAM, ROM and PORT.

Introduction to Intel 8086 Assembly Language Programming: Basic instructions, logic, shift and rotate instructions, addressing modes, stack management and procedures, advanced arithmetic instructions for multiplication and division, instructions for BCD and double precision numbers, introduction to 8086 programming with C language.

Section-B

Embedded System Organization: Introduction to embedded system, categories and applications, Major components in a typical embedded system, operating requirement, modes of operation, hardware/software codesigns, hardware-software trade-offs.

I/O Hardware Interfacing with Intel 8086 Microprocessor: Input devices, output devices, memory mapping, bus structures, programmable peripheral interface, programmable interrupt controller, programmable timer, serial communication interface, keyboard and display interface (LED, 7 segment, dot matrix and LCD), Direct memory access (DMA). Operating System: Design and organization of embedded and real-time operating systems, scheduling, power management, communication, debugging.

Microcontrollers: Basic structures of microcontrollers, basic features, types of microcontrollers, PIC, CISC and RISC microcontrollers, basic features and architecture, memory interfacing, digital I/O, timers, analog interfaces, interrupt services, programming in high-level languages and assembly languages, basic data types, operators, constructs, data structures, compiler directives, power management.

Books Recommended:

1. John P. Hayes : Computer Architecture and Organization
2. Barry B. Brey : Microprocessor Hardware Interfacing and Application
3. Morris Manno : Digital Logic and Computer Design
4. P. Pal Choudhury : Computer Organization and Design
5. M. Morris Manno Computer System and Architecture
6. R. Gaonkar : Microprocessor Architecture, Programming and Applications
7. M. Rafiquzzaman : Microprocessor and Microprocessor-based System Design
8. Ajay V. Deshmukh : Microcontrollers: Theory and Applications
9. Douglas V. Hall : Microprocessors and Interfacing
10. S.K. Bose : Digital Systems from Gate to Microprocessors

EEE 3152 Microprocessors and Embedded Systems Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 3151.

EEE 3161 Electromagnetic Theory and Antenna

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

Field Equations: Field equations based on laws of Coulomb, Amperes and Faraday; Displacement current, Maxwell's equations- differential and integral forms, Units and dimensions of field vectors, E-H symmetry, Lorenz's lemma, scalar and vector potentials, retarded potentials, Laplace's and Poisson's equations and their solutions.

Propagation of Electromagnetic Waves: Wave equations, Helmholtz wave equations for E and H, Plane wave concept, plane electromagnetic wave in loss less media- Doppler effect, transverse electromagnetic wave, polarization of plane wave; plane wave in lossy

media- low-loss dielectrics, good conductors and ionized media, phase and group velocities, Poynting Vector, Joule heating in good conductors.

Reflection and Refraction of Electromagnetic Waves: Boundary conditions, The laws of reflection and Snell's law of refraction, reflection from dielectrics and conductors, Fresnel's equations, The Brewster angle, Total reflection, skin effect, Reflection and refraction in the ionosphere.

Section-B

Antenna Fundamental: Antenna parameters, current and voltage distribution, electrical length, radiation resistance, Radiation Pattern- Isotropic, Directional and Omni Directional Patterns, radiation lobes, radiation power density and intensity, directive gain and directivity, power gain, bandwidth, radiation efficiency, input impedance, effective aperture and antenna temperature, antenna tuning and coupling, Equivalent Circuit Model and Corresponding Parameters, Friis Transmission Equation, Mathematical Formalism for Far Field Analysis.

Types of Antenna: Types of Antenna and Their Applications, Thin linear antenna, antenna arrays; Dipole antenna- Infinitesimal Dipole Antenna, Finite Length Dipole Antenna; Infinitesimal Loop Antenna, Antenna Array, N Element Linear Array, Endfire and Broadside Array- Array Factor and Directivity; Hertz and Marconi antenna, broadcast tower antenna, Yagi antenna, Turnstile antenna, Helical Rhombic, Horn antenna and their uses, Parabolic, Periodic, Parasitic and Lens antenna. Design and applications.

Books Recommended:

1. S. Ramo, J.R. Whinnery and T.V. Duzer : Fields and Waves in Communication Electronics
2. J.D. Ryder : Networks, Lines and Fields
3. D.R. Corson and P. Lorain : Introduction to Electromagnetic Field and Wave
4. D. K. Chang : Electromagnetic Fields and Waves
5. J.D. Kraus : Antenna
6. S.L. Gupta and V. Kapur : Handbook of Electronics

B.Sc. Engg. Part-III, Even Semester, Examination 2019

EEE 3211 Control Systems

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Review of Laplace transform, Initial and Final value theorems.

Transfer Functions: Open-loop stability, Poles, Zeros, Time response, Transients, Steady-state, Block diagrams and signal flow diagram.

Feedback Principles: Open versus Closed-loop control, High gain control, Inversion.

State Variables: Signal flow diagram to state variables, transfer function to state variable and state variable to transfer function, Stability of closed-loop systems: Routh's method, Root locus.

PID Control: Structure, Design using root locus.

Section-B

Pole Assignment: Sylvester's theorem, PI and PID synthesis using pole assignment.

Frequency Response: Nyquist plot, Bode diagram, Nyquist stability theorem, Stability margins, Closed-loop sensitivity functions, Model errors, Robust stability.

Controller Design using Frequency Response: Proportional control, Lead-lag control, PID control, Digital control systems: introduction, sampled data systems, stability analysis in Z-domain.

Books Recommended:

1. Norman S. Nise : Control Systems Engineering
2. I.J. Nagrath : Control Systems Engineering
3. R. C. Dorf and R. H. Bishop : Modern Control Systems
4. D K Anand : Introduction to Control Systems
5. Bernard Friedland : Control System Design: An Introduction to State-Space Method

EEE 3212 Control System Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/
Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 3211.

EEE 3221 Power System II

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six
taking not more than Two from each section)

Section-A

Power System Stability: Definition and classification of stability, two axis model of synchronous machine, loading capability, rotor angle stability – swing equation, power-angle equation, synchronizing power coefficients, equal area criterion, multi-machine stability studies, step-by-step solution of the swing curve, factors affecting transient stability. Frequency and voltage stability.

Power distribution: D.C and A. C distribution, calculation for different network configuration.

Flexible AC transmission system (FACTS): Introduction, shunt compensation (SVC, STATCOM), series compensation (SSSC, TCSC, TCSR, TCPST), series-shunt compensation (UPFC).

Section-B

Power Quality: Voltage sag and swell, surges, harmonics, flicker, grounding problems; IEEE/IEC standards, mitigation techniques.

Insulators of Overhead Transmission Lines: Types of insulators and their coordination. Electric stress calculations and string efficiency. Insulator testing.

Mechanical Characteristics of Transmission Lines: Sag calculations and stress analysis.

Insulated Cable: Insulating materials, Electric stress grading of single phase and three phase cable. Dielectric losses and heating. Modern development, testing of insulated cables. Corona power loss. Kelvin's law. Economic conductor section, limitation and selection of ideal voltage.

Books Recommended:

1. V.K. Mehta and Rohit Mehta : Principles of the Power System
2. Kothari and Nagrath : Power System Engineering
3. M. N. Bandyopadhyay : Electrical Power Systems: Theory And Practice
4. John Grainger, William Stevenson Jr. : Power System Analysis
5. Arthur R. Bergen and Vijay Vittal : Power Systems Analysis
6. Paul M. Anderson, A. A. Fouad : Power System Control and Stability

EEE 3222 Power System II Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 3221.

EEE 3231 Digital Signal Processing

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

Introduction: Discrete-time signals and systems, analog to digital conversion, impulse response, finite impulse response (FIR) and infinite impulse response (HR) of discrete-time systems, difference equation, convolution, transient and steady state response.

Discrete Transformations: Discrete Fourier series, discrete-time Fourier series, discrete Fourier transform (DFT) and properties, fast Fourier transform (FFT), inverse fast Fourier transform, Z transformation-properties, transfer function, poles and zeros and inverse Z transform.

Section-B

Correlation: Circular convolution, auto-correlation and cross correlation.

Digital Filters: FIR filters-liner phase filter, specifications, design using window, optimal and frequency sampling methods; IIR filters-

specifications, design using impulse invariant, bi-liner Z transformation, least-square methods and finite precision effects.

Books Recommended:

1. A.V. Oppenheim, R. W. Schafer and J.R. Buck : Discrete-Time Signal Processing
2. Dag Stranneby and William Walker : Digital Signal Processing And Applications
3. J. G. Proakis and D.G. Manolakis : Digital Signal Processing: Principles, Algorithms and Applications

EEE 3232 Digital Signal Processing Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 3231.

EEE 3241 Communication Systems I

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Overview of Communication Systems: Basic principles, fundamental elements, system limitations, message source, bandwidth requirements, Transmission types- base-band transmission, carrier transmission; transmission media types, bandwidth and transmission capacity.

Noise: Sources of noise, characteristics of various types of noise and signal to noise ratio.

Analog Communication:

Analog Modulation and Demodulation: Amplitude modulation (AM)- introduction, DSB, SSB, VSB, quadrature; spectral analysis of each type, envelope and synchronous detection; angle modulation-instantaneous frequency, frequency modulation (FM) and phase modulation (PM), spectral analysis, demodulation of FM and PM.

Radio System: Radio Transmitter- classification, elements of AM, FM and SSB transmitter, master oscillator, mixer, RF power amplifier, pre-emphasis circuits, Radio Receiver- classification, elements of AM, FM and SSB receiver, AGC, AFC, de-emphasis

circuits, noise limiter, cross modulation, Design of radio transmitter and receiver circuits.

TV System: Elements of TV system, principle of operation, TV signals generation, composite video signal, TV transmitter and receiver, transmitting and receiving antenna, picture tube; Introduction to color TV-compatibility, three color theory, Grassman's law, color display tube; VCR, CCTV, CATV, MATV, TV Booster.

Section-B

Digital Communication:

Introduction: Baseband digital transmission, Limitations, Channels for digital communication, AWGN channel model, bit error rate of a baseband transmission system, channel capacity theorem, channel coding theorem.

Waveform Coding Techniques: Sampling- sampling theorem, Nyquist criterion, aliasing, instantaneous and natural sampling, flat-topped sampling; message reconstruction rom its samples, PAM, PCM, quantization noise, channel noise, SNR, robust quantization, differential PCM, delta modulation (DM)- principle, adaptive DM; line coding- formats and bandwidths.

Detection and Estimation: Model of digital communication system, detection of signals in noise, probability of error, correlation receiver, matched filter receiver. Estimation: MLE, Weiner filters, Adaptive filters, linear prediction. Bit error rate calculation of a digital link, digital link design.

Digital Modulation Techniques: Binary modulation techniques: ASK, PSK, and FSK, Detection of ASK, PSK, and FSK, Quadrature modulation techniques, M-ary modulation techniques, power spectra, effect of intersymbol interference.

Error Correction Coding: Block codes, cyclic codes, systematic and nonsystematic cyclic codes, convolutional codes, Trellis codes, decoding techniques.

Books Recommended:

1. Kennedy and Davis : Electronic Communication Systems
2. Roddy and Coolen : Electronic Communications
3. G. K. Mathur : Radio Engineering
4. B. Grob : Basic TV
5. Gulati : Monochrome and Color TV
6. S.L. Gupta and Kumar : Electronics
7. S Haykin Digital Communication Systems
8. Kennedy-Davice Electronic Communication Syatems
9. Theodore S. Rappaport Wireless Communications: Principles and Practice

EEE 3242 Communication Systems I Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 3241.

EEE 3251 Measurement and Instrumentation

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

Introduction: Methods of measurement, Statistical method applied to field of measurement and error analysis and calibration.

Resistance, Inductance and Capacitance Measurement: Different Methods of measuring high, medium and low resistances. Methods of measuring self and mutual inductance and capacitance measurement. A.C and D.C bridge methods, Measurement of insulation and earth resistances, Localization of cable fault.

Magnetic Measurement: Ballistic galvanometer, Tangent galvanometer, D-Arsonval galvanometer, Flux meter, Flux and Flux density measurement, Determination of iron losses and their separation.

Speed, frequency and phase difference measurement. Illumination measurement.

Measuring Instruments: Classification of measuring instruments, Ammeter, Voltmeter, wattmeter, AVO meter, Energy meter, Ampere-hour meter and Maximum demand meter for measuring AC and DC quantities.

Section-B

Electronic Measuring *i*nstruments: Digital instruments, VTVM, Q-meter and CRO.

Instrumentation: Extension of instrument range, Use of C.T and P.T and calculation of their burden, Instrumentation of substation.

Current and Potential Transformer, Transducer-mechanical, electrical and optical.

Measurement of Non-electrical Quantities: Measurement of temperature, pressure, displacement, velocity acceleration. Strain gauge and their applications.

Books Recommended:

1. A.K. Sawhney : Electrical and Electronic Measurement and Instrumentation
2. U.A. Bakshi and A.V. Bakshi : Electrical Measurements and Instrumentation
3. Alan S. Morris : Measurement and Instrumentation Principles
4. Robert B. Northrop : Introduction to Instrumentation and Measurements
5. Roman Malaric : Instrumentation and Measurement in Electrical Engineering

EEE 3252 Measurement and Instrumentation Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 3251.

EEE 3261 Project Planning, Management and Engineering

50 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 2, Contact hours/week: 2, Exam. Time: 2 hours
(Students should answer Four questions out of Six taking not more than Two from each section)

Section-A

Definitions of project and project management in the Engineering point of view.

Project Initiation, Project selection, Project manager, Project organization and Project planning. Project feasibility study.

Section-B

Project Implementation: Project management, Budgeting and cost estimation, Project control and Human aspects of project management. Network techniques of project management; PERT, CPM, and Gantt Charts.

Books Recommended:

1. Albert Lester, Eur Ing, CEng, FICE, FIMechE, FIStructE, FAPM : Project Management, Planning and Control
2. Garold D Oberlender : Project Management for Engineering and Construction
3. Nigel J. Smith : Engineering Project Management
4. M. Kemal Atesmen : Global Engineering Project Management

EEE 3272 Electronic Shop Practice

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Introduction to formal procedures of preventive maintenance, Circuit tracing, trouble shooting, fault repairing, soldering and de-soldering of electronic circuits, Design of PCB layout, etching.

Radio receivers: Principles of operations, circuit tracing, fault finding by signal injection alignment, TV camera, B/W TV, color TV, CD and VCD player.

Books Recommended:

1. Keith Mobley, Lindley Higgins and Darrin Wikoff : Maintenance Engineering Handbook
2. Tim Williams : The Circuit Designer's Companion
3. Marcus and Lavy : Elements of Radio Servicing
4. Mark I. Monstrose : A Handbook for Designers

B.Sc. Engg. Part-IV, Odd Semester, Examination 2020

EEE 4111 Power Plant Engineering and Economy

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Power plants: Types, Thermal power station- general layout of a thermal power plant, heat rate, incremental heat rate, efficiency, capacity scheduling, load division; principles and construction of gas turbine, steam turbine, diesel, combined cycle, hydro and nuclear, and magneto-hydrodynamic power plants.

Variable load problems, plotting and analysis of load curves, chronological load curves and load duration curve. Energy load curve and its use. Load factor, capacity factor, demand factor, utilization factor, diversity factor etc. and there impact over the cost analysis of power generation and utilization. Load forecasting, selections of units and plant location.

Load Shearing: Base load and peak load plants. Use of chronological load curves to distribute load among units.

Section-B

Power Plant Economics: Economic operation of power plants. Input output curve, heat rate curve, incremental rate curve. Use of incremental rate curve for optimum load scheduling. Transmission line loss, determination of loss co-efficient. Economic conductor selection, Kelvin's law. Graphical method for location of distribution systems. Tariff and tariff design. Bus system. Importance of power control. Current limiting reactors. Different types of bus system layout. Forces on bus section in case of short circuit.

Books Recommended:

1. William A. Vopat : Power Station Engineering and Economy
2. P. K. Nag : Power Plant Engineering
3. Bernhardt G.A. Skrotzki, W.A. Vopat : Power Station Engineering and Economy

EEE 4121 VLSI Circuits and Design

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

IC trends, technology and design approaches. MOS device: structure, operation, threshold voltage and characteristics.

Ratioed Circuits : NMOS inverter with resistive and transistor load, Pseudo NMOS inverter.

Ratioless Circuits : CMOS inverters : operation, transfer characteristics, design for equal rise and fall time, propagation delay, rise time, fall time and power consumption estimation. NMOS pass transistor and CMOS pass gate circuits. Buffer chain design to drive large capacitive load.

Integrated Circuit Fabrication Technology: Microelectronic technology, planner process, photolithography, BJT fabrication, FET fabrication, CMOS technology-CMOS process flow, design rules. Monolithic diodes, metal-semiconductor contact, IC resistor and capacitor, IC packaging, characteristics of IC components, microelectronic circuit layout, printed circuit board. Estimation of resistance and capacitance from layout. Layout matching. Stick diagram and area estimation from stick diagram. Reliability issues : Latch-up, electromigartion.

Section-B

Basic logic gates in CMOS. Synthesis of arbitrary combinational logic in CMOS, pseudo-NMOS, dynamic CMOS, clocked CMOS and CMOS domino logic. Structured design : Parity generator, bus arbitration logic, multiplexers based design, programmable logic array (PLA) design, Field Programmable gate arrays (FPGA), I/O systems. Clocked sequential circuit design: two phase clocking, dynamic shift register. CMOS latches and flip flops. Introduction to VHDL hardware description language.

Subsystem Design: 4-bit arithmetic processor: bus architectures, shifter, design of a general purpose ALU.

Memory Elements Design: System timing consideration, three transistor and one transistor dynamic memory cell. Pseudo-static RAM/register cell. 4 transistor dynamic and 6 transistor static CMOS memory cell. 4x4 bit register array and 16 bit static CMOS memory array.

Finite State Machine Design: Design of Moore Type and Mealy type FSM using Verilog.

Testing VLSI circuits.

Books Recommended:

1. Frank Vahid : Digital Design with RTL Design, VHDL and Verilog
2. Wayne Wolf : Modern VLSI Design: IP-based Design
3. Volnei A. Pedroni : Circuit Design and Simulation with VHDL
4. Neil Weste, David Harris : CMOS VLSI Design: A Circuits and Systems Perspective
5. John P. Uyemura Introduction to VLSI Circuits and Systems
6. Douglas A. Pucknell, Kamran Eshraghian Basic VLSI Design

EEE 4122 VLSI Circuits and Design Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 4121.

EEE 4131 Optoelectronics

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Optical Properties in Semiconductor: Direct and indirect band-gap materials, basic transitions in semiconductors, radiative and nonradiative recombination, optical absorption, photo-generated excess carriers, minority carrier life time, luminescence and quantum efficiency in radiation.

Properties of Light: Particle and wave nature of light, polarization, interference, diffraction and blackbody radiation.

Light Emitting Diode (LED): Principles, materials for visible and infrared LED, internal and external efficiency, loss mechanism, structure and coupling to optical fibers. Double-Hetero-structure (DH) LEDs, Characteristics, Surface and Edge emitting LEDs.

Stimulated Emission and Light Amplification: Spontaneous and stimulated emission, Einstein relations, population inversion, absorption of radiation, optical feedback and threshold conditions.

Section-B

Semiconductor Lasers: Population inversion in degenerate semiconductors, laser cavity, operating wavelength, threshold current density, power output, elementary laser diode characteristics, heterojunction lasers, optical and electrical confinement. single frequency solid state lasers-distributed Bragg reflector (DBR), distributed feedback (DFB) laser.

Introduction to quantum well lasers. Introduction to quantum well lasers, Vertical Cavity Surface Emitting Lasers (VCSELs), optical laser amplifiers.

Photo-detectors: Photoconductors, junction photo-detectors, PIN detectors, avalanche photodiodes, hetero-junction photodiodes, Schottky photo-diodes and phototransistors. Noise in photodetectors. PIN and APD. Photo-detector design issues. Solar cells: Solar energy and spectrum, silicon and Schottkey solar cells. Modulation of light: Phase and amplitude modulation, electro-optic effect, acousto-optic effect and magneto-optic devices. Introduction to integrated optics.

Books Recommended:

1. Wilson and Hawkes : Optoelectronics: An Introduction
2. J. Wilson, J.F.B. Hawkes : Optoelectronics
3. Michael A. Parker : Physics of Optoelectronics
4. Pallab Bhattacharya : Semiconductor Optoelectronic Devices
5. S.C. Gupta Optoelectronic Devices and Systems
6. Joachim Piprek Optoelectronic Devices
7. Giovanni Ghione, Politecnico di Torino Semiconductor Devices for High-Speed Optoelectronics

EEE 4141 Communication Systems II

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Telecommunication Engineering:

Introduction: Simple telephone communication, Basic switching system, Transmission bridge, Subscriber line circuit, CB cord circuit, Junction working.

Strowger Switching Systems: Relay dial telephone, Signaling tones, Strowger switching component, Step-by-step switching, Design parameters, 100-line switching system, 1000-line blocking exchange, 10,000-line exchange.

Crossbar Switching: Principle of common control, Touch tone dial telephone, Principles of crossbar switching, Crossbar switching configuration, Cross point terminology, Crossbar exchange organization. Telephone Networks: Subscriber loop systems, Switching hierarchy and routing, Transmission plan, Transmission systems, Numbering plan, Charging plan, Signaling techniques, Inchannel signaling, Common channel signaling.

Electronic Switching: Stored program control, Centralized SPS, Software architecture, Application software, Enhanced services, Two-stage network, Three-stage network, n-stage network, Concept of TDM, Basic time division space switching, Basic time division time switching, Time multiplexed space switching, Time multiplexed time switching, Combination switching, Three-stage combination switching, n-stage combination switching.

Multiplexing Technique: TDM, FDM, SDH, PDH, SONET, WDM, SONET over WDM.

Access Network Technology: DSL, VDSL, HDSL, Fiber Access Network, FTTX.

Traffic Engineering: Network traffic load and parameters, Grade of services and blocking probability, Modeling switching systems, Incoming traffic and service time characterization, Blocking models and loss estimates, Delay systems

Section-B

Satellite Communication:

Introduction, Satellite construction, Orbits, station keeping ,Satellite altitude, Transmission path , path loss, Noise considerations, satellite system, Saturation flux density, Effective isotropic radiated power, Multiple access methods, Modulation schemes used in the satellite links. FDMA, TDMA, CDMA and packet switched system, Satellite classes, Low orbit satellites for mobile communication, Earth station, Satellite link analysis.

Optic Fiber Communication:

Introduction, Principle of light transmission in a fiber, propagation of light in an optical fiber: ray model and wave model. Losses in fibers, Dispersion, Light sources for fibers, Photo detector connector and splices. Fiber optic link design, Power and rise time budget, SNR and BER calculations, Introduction to coherent optical communication

WDM systems, Devices for coherent optical communication like directional couple, Optical amplifiers, Introduction to high speed long distance fiber optic links.

Books Recommended:

1. John Bellamy : Digital Telephony
2. T. Viswanathan : Telecommunication Switching Systems and Networks
3. J. Martin : Communication Satellite System
4. D. Raddy and Coolen : Electrical Communication
5. S.E. Miller and A.G. Chynoweth : Optical Fiber Communication
6. M.S. Roden : Analog and Digital Communication System
7. Chrin : An Introduction to Optical Fiber
8. J.M. Senior Optical Fiber Communication

EEE 4142 Communication Systems II Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 4141.

EE 4151 Computer Networks

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Introduction: Computer networks, Types of computer networks, Network topology, Circuit switching and packet switching, Protocol and protocol hierarchies, The OSI reference model, TCP/IP protocol suit.

Physical Layer: The theoretical basis for data communication, Transmission media: Wired and wireless, Narrowband ISDN, Broadband ISDN and ATM.

Data link Layer: Data link layer design issues, Error detection and correction, Elementary data link protocols, Sliding window protocols, Protocol specification and verification, HDLC.

Medium Access Sublayer: Channel allocation problem, Multiple access protocols, IEEE standards for LANs and MANs, Bridges, and high speed LANs, ATM and frame relay.

Section-B

Network Layer: Network layer design issues, Routing algorithms, Congestion control algorithms, Internetworking, IP, IP addresses, Network layer protocols; ARP, IPv4, ICMP, IPv6, Routing protocols; OSPF and BGP.

Transport Layer: Process-to-process delivery, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Congestion control and quality of service, Performance issues.

Application Layer: Client-server model, Domain Name System (DNS), Electronic mail (SMTP) and File Transfer Protocol (FTP), HTTP and WWW.

Books Recommended:

1. A. S. Tanenbaum : Computer Networks
2. Behrouz A. Forouzan : Data Communication and Networking
3. J.F. Kurose and K.W. Ross : Computer Networking
4. W. Stallings : Data and Computer Communication

EEE 4152 Computer Networks Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 4151.

EEE 4161 High Voltage Engineering

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

High Voltage DC Generation: Rectifier circuits, ripple minimization, voltage multipliers,

Van-de-Graaf and electrostatic generators; applications.

High Voltage AC Generation: Tesla coils, cascaded transformers and resonance transformers.

Impulse Voltage Generation: Shapes, mathematical analysis, codes and standards, single and multi-stage impulse generators, tripping and control of impulse generators.

Brekdown in gas, liquid and solid dielectric materials, applications of gas and solid dielectrics in transformer. Corona.

Section-B

High Voltage Measurements and Testing: IEC and IEEE standards, sphere gap, electrostatic voltmeter, potential divider, Schering bridge, Megaohm meter, HV current and voltage transducers: contact and noncontact.

Over-volage phenomenon and insulation coordination. Lightning and switching surges, basic insulation level (EV, EHV and UHV systems), surge diverters and arresters.

Books Recommended:

1. John Kuffel and Peter Kuffel : High Voltage Engineering Fundamentals
2. Wolfgang Hauschild, Eberhard Lemke : High-Voltage Test and Measuring Techniques
3. Ravindra Arora : High Voltage and Electrical Insulation Engineering
4. Farouk A.M. Rizk, Giao N. Trinh : High Voltage Engineering

EEE 4162 High Voltage Engineering Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 4161.

EEE 4171 Microwave Engineering and Radar System

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight taking not more than Three from each section)

Section-A

Transmission Lines: Transmission line equations and parameters, transmission line configuration and formulae, transmission line at radio frequency, impedance matching, line termination, The Terminated Lossless Transmission Lines, The Smith chart, The

Quarter-Wave Transformers, S.W.R.Q and band width, Balanced and unbalanced feeder from transmitter to antenna, Transmission at radio frequency, Generator and Load Mismatches, Impedance Matching and Tuning, Lossy Transmission Lines.

Wave Guides: General Formulation, Modes of Propagation and Losses in Parallel Plate, Rectangular and Circular Waveguides, scattering parameters, wave guide tees, directional couplers, circulators and isolators, phase shifter and attenuator, application of waveguides.

Microstrip Lines: Structures and Characteristics.

Microwave Resonators: Waveguide Cavity Resonators, Microstrip Resonators.

Microwave Network Analysis: Scattering Matrices and Multiport Analysis Techniques.

Microwave Tubes: Klystron amplifier, Reflex Klystron Oscillator, Magnetron, TWT amplifier, BWO, Maser.

Semiconductor Microwave Devices: Tunnel diodes, Gun-effect diodes, IMPATT diodes.

Section-B

Microwave Measurement Techniques: Microwave components and measuring instruments, Five basic microwave measurement: Power, Transmission, Impedance, Frequency and noise, Measurement based on transmission and reflection, Radiation pattern measurements, Antenna range design and evaluation, Frequency response test set, TDR systems.

Microwave Link: Microwave link and its advantage, Frequency assignment and modulation methods, Transmitting and receiving equipment, Base band repeater, IF repeater, Microwave carrier supply, Microwave antenna-Horn antenna, Rhombic and slot antenna, parabolic antenna, Antenna arrays and their feeding techniques; Microwave relay system.

Radar System: Basic principle, Radar equation and range, Factor influencing maximum range, Effect of noise, Power, Frequency used in radar, Types of radar, CW and FM radar; Doppler effect MTI and pulse radar: Duplexer radar receiver, Indicator and timers: Altimeter and IFR equipment; radar transmitter and receivers, introduction to polarimetric radar and synthetic aperture radar; Tracking radar systems and search systems, Lens and parabolic antenna for radar and navigation.

Books Recommended:

1. D M Pozar : Microwave Engineering
2. Thomas G Lavevghetta : Microwave Measurements and Technique
3. D. Roddy and Coolen : Electrical Communication
4. M. I. Skolnik : Introduction to Radar System
5. Kennedy and Davis : Electronics Communication System
6. J.C. Hancock : An Introduction to the Communication Principles and Communication Theory
7. S. Gupta : Microwave Engineering
8. Y. Liao : Microwave Devices and Circuits
9. U.A. Bakshi, A.P. Godse and U.A. Bakshi : Antenna and Wave Propagation

EEE 4172 Microwave Engineering and Radar System Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 4171.

EEE 4182 Industrial Training

25 Marks [30% Internal Examiner, 70% Presentation and Oral Examination]
Credits: 1, Contact hours/week: 2

Students will be attached with the Electrical and Electronic Engineering related industries/service agencies for two weeks to take Professional/Industrial/In-Plant training. This training is to be organized after completion of their third year odd semester or during any vacation in Third year Even semester to gain practical knowledge.

B.Sc. Engg. Part-IV, Even Semester, Examination 2020

EEE 4211 Power System Protection and Switchgear

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Philosophy of switchgear and protection. Circuit breakers, principle of arc extinction in DC and AC circuit breakers. Recovery voltage, rate of rise of recovery voltage and other transient phenomena. Switching surges. Disconnection of unloaded transformer and transmission line. Speed of circuit breaker. Construction, operation. rating and testing of bulk oil and minimum oil breaker, SF6 circuit breaker, ABCD and ACB. Selection of circuit breaker. Travelling wave in transmission line. Surge absorber, lightning arrester, horn gap, its rating and testing.

Protective Relaying: Relay voltage rating, high, medium and low. Basic protective zone. Relaying Scheme.

Section-B

Electromechanical Relays: Principal general equation. over current, balanced current, overvoltage, distance, directional, positive sequence, negative sequence and differential relays and their applications.

Static Relays: Introduction to solid state device in the construction of static relays. Different type of static relays. Generator protection. Transformer protection, Bucholz's relay. Protection of bus bar, transmission line, feeder etc. Relay testing.

Books Recommended:

1. Sunil S. Rao : Switchgear protection and power systems
2. T. S. Madhava Rao : Power System Protection Static Relays
3. Badri Ram and D. Vishwakarma : Power System Protection and Switchgear
4. Paul M. Anderson : Power System Protection

EEE 4212 Power System Protection and Switchgear Sessional

25 Marks [60% Practical/Design Work/ Report, 30% Quizzes/ Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 4211.

EEE 4221 Cellular and Mobile Communication

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Introduction: Evolution of mobile radio communication, Introduction to 2G, 2.5G and 3G wireless networks, Paging, Cordless telephony, Cellular telephony, Cellular Concept-Noncellular and cellular communication, evolution and fundamentals, analog and digital cellular systems.

Cellular Radio System: Frequency reuse techniques, co-channel interference, cell splitting and components.

Mobile Radio Propagation: Propagation characteristics, models of radio propagation, antenna at cell site and mobile antenna.

Frequency Management and Channel Assignment: Fundamentals, spectrum utilization, fundamentals of channel assignment, traffic and channel assignment.

Handoffs and Dropped Calls: Reasons and types, forced handoffs, mobile assisted handoffs and dropped call rate.

Section-B

Multiuser Systems: Multiuser channels: the uplink and downlink, Multiple-access techniques: TDMA, FDMA, CDMA - spread spectrum multiplexing, coding techniques and constraints of CDMA.

Diversity and Equalization Techniques: Concept of diversity branch and signal paths, Diversity techniques: Time diversity - repetition coding, beyond repetition coding. Antenna diversity - SC, MRC, EGC, spacetime coding. Frequency diversity - fundamentals, single-carrier with ISI equalization, DSSS, OFDM, Alamouti space-

time block coding, carrier to noise and carrier to interference ration performance, Equalizer noise enhancement, Equalizer types.

Space-time Communications: Multiantenna techniques, MIMO channel capacity and diversity gain, STBC, OSTBC, QOSTBC, SM, BLAST, smart antennas, frequency selective MIMO channels.

Broadband Communications: DSSS, FHSS, spreading codes, RAKE receivers, MC-CDMA, OFDM, OFDMA, multiuser detection, LTE, WiMAX.

Books Recommended:

1. T.S. Rappaport : Principles of Wireless Communication
2. Pahlavan and Krishnamurty : Principles of Wireless Network
3. VK Garg and J E Wilkis : Principles and Application of GSM
4. Y. Lee : Mobile Cellular Communication
5. A J Goldsmith : Wireless Communication
6. A Molisch : Wireless Communication

EEE 4222 Cellular and Mobile Communication Sessional

25 Marks [60% Practical/Design Work/Report,
30% Quizzes/Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 4221.

EEE 4231 Biomedical Engineering

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Origin and Major Types of Biological Signals: Human body: cells and physiological systems, bioelectric potential, bio-potential electrodes and amplifiers, blood pressure, flow, volume and sound, electrocardiogram, electromyogram, electroencephalo-gram, phonocardiogram, vector cardiogram. Interpretation of bio-signals. Noise in bio-signals.

Section-B

Measurement of Bio-signals: Transducers, amplifiers and filters. Measurement and detection of blood pressure. Blood flow measurement: plethysmograph and electromagnetic flow meter. Measurement of respiratory volumes and flow, related devices. Xray. Tomograph: positron emission tomography and computed tomography. Magnetic resonance imaging. Ultrasonogram. Patient monitoring system and medical telemetry. Therapeutic devices: cardiac pacemakers and defibrillators. Electrical safety in bio instrumentations and sensing.

Books Recommended:

1. John D Enderle : Introduction to Biomedical Engineering
2. Joseph D. Bronzino : The Biomedical Engineering Handbook
3. W. Mark Saltzman : Biomedical Engineering
4. Kayvan Najarian : Biomedical Signal and Image Processing
5. Professor Mark Walters Biomedical Engineering Applications

EEE 4232 Biomedical Engineering Sessional

25 Marks [60% Practical/Design Work/ Report,
30% Quizzes/Viva-Voce, 10% Attendance]
Credits: 1, Contact hours/week: 2

Sessional based on the theory of course EEE 4231.

EEE 4241 Renewable Energy

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Renewable Energy Sources: Solar, wind, mini-hydro, geothermal, biomass, wave and tides.

Solar Photovoltaic: Characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, sun tracking systems, Maximum **Power Point Tracking (MPPT):** Chopper, inverter. Sizing the PV panel and battery pack in stand-alone PV applications. Modern solar energy applications (residential, electric vehicle, naval, and space). Solar power plants connected to grid.

Solar Thermal: Principles of concentration, solar tower, parabolic dish, receiver, storage, steam turbine and generator.

Section-B

Wind Turbines: Wind turbine types and their comparison, power limitation, Betz‟s law; Control mechanism: pitch, yaw, speed. Couplings between the turbine and the electric generator, Wind turbine generator - DC, synchronous, self excited induction generator and doubly fed induction generator. Grid interconnection: active and reactive power control.

Biomass and biogas electricity generation.

Books Recommended:

1. D. Rapp : Solar Energy
2. M.J. Fish and H.C.W. Anderson : Introduction to Solar Technology
3. M.A. Green : Solar Cells
4. B.S. Magal : Solar Power Engineering
5. G.D. Rai Solar Energy Utiliztion
6. G.D. Rai Nonconventional Source of Energy

EEE 4251 Power System Operation and Control

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Overview: Vertically integrated vs. deregulated power system. Realtime operation: SCADA; EMS (energy management system); various data acquisition devices - RTU, IED, PMU, DFDR, WAMPAC (wide area monitoring, protection and control).

Application Functions: State estimation; short term load forecasting; unit commitment (UC); economic dispatch (ED); optimal power flow (OPF). Frequency control: generation and turbine governors, droop, frequency sensitivity of loads, ACE (area control error), AGC (Automatic Generation Control) and coordination with UC and ED; frequency collapse and emergency load shed.

Power system security: Static and dynamic; security constrained OPF.

Section-B

Electricity Market Operation: GenCos, ISO, DisCos, bidding, spot market, social welfare, market clearing price (MCP), locational marginal price (LMP), bilateral contracts and forward market, hedging.

Demand Side Control: DMS (distribution management system), DSM (demand side management), smart grid concept.

Books Recommended:

1. P.S.R. Murty : Operation and Control in Power Systems
2. Dr. K. Uma Rao : Power System: Operation and Control
3. Robert Miller, James Malinowski : Power System Operation
4. Allen J. Wood and Bruce F. Wollenberg : Power Generation, Operation and Control

EEE 4261 Nuclear Power Engineering

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Basic Concepts: Nuclear energy, atoms and nuclei, radioactivity, nuclear processes, fission, fusion.

Nuclear Systems: Particle accelerator, isotope separators, neutron chain reaction, reactor types, power generation. Layout of nuclear power plant (NPP).

Nuclear Power Plant Reactors : Pressurized water reactor, boiling water reactor, CANDU reactor, gas cooled reactor, liquid metal cooled reactor, breeder reactor. Auxiliaries, instrumentation and control.

Section-B

Grid Interconnection Issues: Effects of frequency and voltage changes on NPP operation. Advanced and next generation nuclear plants; very high temperature reactors. Biological effects, reactor safety and security; Three Mile island case; Chernobyl case; Fukushima case. Fuel cycle; radioactive waste disposal.

Books Recommended:

1. M M El-Wakil : Nuclear Power Engineering
2. Dr.-Ing. habil. Rüdiger Meiswinkel, Dr.-Ing. Julian Meyer, Prof. Dr.-Ing. Jürgen Schnell : Design and Construction of Nuclear Power Plants
3. Janet Wood : Nuclear Power
4. John R. Lamarsh and Anthony J. Baratta : Introduction to Nuclear Engineering

EEE4271 Processing and Fabrication Technology

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Substrate Materials: Crystal growth and wafer preparation, epitaxial growth technique, molecular beam epitaxy, chemical vapor phase epitaxy and chemical vapor deposition (CVD).

Doping Techniques: Diffusion and ion implantation. Growth and deposition of dielectric layers: Thermal oxidation, CVD, plasma CVD, sputtering and silicon-nitride growth.

Introduction to Semiconductor Characterization Tools.

Section-B

Etching: Wet chemical etching, silicon and GaAs etching, anisotropic etching, selective etching, dry physical etching, ion beam etching, sputtering etching and reactive ion etching. Cleaning: Surface cleaning, organic cleaning and RCA cleaning. Lithography: Photoreactive materials, pattern generation, pattern transfer and metalization. Steps of lithography. Non-optical lithography.

Discrete Device Fabrication: Diode, transistor, resistor and capacitor. Integrated circuit fabrication: Isolation - pn junction isolation, mesa isolation and oxide isolation. BJT based microcircuits, p-channel and n-channel MOSFETs, complimentary MOSFETs and silicon on insulator devices. Testing, bonding and packaging.

Books Recommended:

1. Michael E. Levinshtein and Michael S. Shur : Semiconductor Technology: Processing and Novel Fabrication Techniques
2. Yoshio Nishi, Robert Doering : Handbook of Semiconductor Manufacturing Technology
3. Peter Van Zant : Microchip Fabrication: A Practical Guide to Semiconductor Processing
4. Simon M. Sze and Ming-Kwei Lee : Semiconductor Devices: Physics and Technology
5. Stephen A. Campbell : The Science and Engineering of Microelectronic Fabrication
6. Gary S. May and Simon M. Sze : Fundamentals of Semiconductor Fabrication
7. R. Castellano : Semiconductor Device Processing: Technology Trends in the VLSI Era
8. Peter Van Zant : Microchip Fabrication: A Practical guide to Semiconductor Processing

EEE 4281 Compound Semiconductor Devices

75 Marks [70% Exam, 20% Quizzes/Class Tests, 10% Attendance]
Credits: 3, Contact hours/week: 3, Exam. Time: 3 hours
(Students should answer Six questions out of Eight
taking not more than Three from each section)

Section-A

Reviews of Compound Semiconductor: Zinc-blend crystal structures, growth techniques, alloys, band gap, basic opto-electronic properties, density of carriers in intrinsic and doped compound semiconductors.

Introduction to Physics of Hetero-Junctions: Band alignment, band offset, Anderson"s rule, single and double sided hetero-junctions, quantum wells and quantization effects, lattice mismatch and strain and common hetero-structure material systems.

Hetero-Junction Diode: Band banding, carrier transport and I-V characteristics. Hetero-junction field effect transistor: Structure and principle, band structure, carrier transport and I-V characteristics. Nonideal effects, frequency response, high electron mobility transistor.

Section-B

Hetero-structure Bipolar Transistor (HBT): Structure and operating principle, quasi-static analysis, extended Gummel-Poon model, Ebers-Moll model, secondary effects and band diagram of a graded alloy base HBT.

Resonant Tunneling Diodes: Physics and operation. Resonant Tunneling Transistors: device physics, operation and characteristics.

Books Recommended:

1. Kenneth A. Jackson : Compound Semiconductor Devices: Structures and Processing
2. Sandip Tiwari : Compound Semiconductor Device Physics
3. Michael Shur : Physics of Semiconductor Devices
4. H. Craig Casey : Devices for Integrated Circuits: Silicon and III-V Compound Semiconductors
5. S. M. Sze Semiconductor Devices: Physics and Technology

EEE 4292 Project

100 Marks [30% Internal Examiner/Supervisor,
30% External Examination, 40% Presentation and Oral Examination]
Credits: 4, Contact hours/week: 8

Each student has to complete a project in the fields of Electrical and Electronic Engineering in the combined duration of two semesters of Part-IV. A project will be assigned to the students in 4th year Odd semester class and it will continue till 4th year Even semester. The objective is to provide an opportunity to the students to develop initiative, creative ability, confident and engineering judgment. The results of the work should be submitted in the form of a dissertation, which should include appropriate drawings, charts, tables, references, etc.

Project Dissertation/Report must be submitted by the end of the Even semester and make an oral defense of the project. Project Evaluation will be made in the Even semester.

EEE 4200 Board Viva-Voce

50 Marks [100% Viva-voce], 2 credits

Board Viva-voce will be conducted by Examination Committee.