**Course Syllabus**

**EET\_121: Basic Electronics**

**Semester / Session: 2nd semester /Spring 2020**

**Instructor:**  Ms. Nasim Zahra

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**Office Hours:** 0800hrs to 1600hrs

**Class Hours:** 02:00 – 05:00 PM Monday

**Course TA:** N.A.

**Course Description:** This subject is intended to provide students with the fundamentals of semiconductor physics and its application to common semiconductor devices. The course starts with an in-depth look at the theory of semiconductors including energy gap, mobility of electrons and holes, influence of temperature on conductivity, doping, photoconductivity, drift and diffusion of charge carriers and the ideal diode equation, diode models. Then, properties of the abrupt p-n junction are studied and applied to various practical devices including the signal diode, zener diode, varactor diode, photo-diode, light-emitting diode, bipolar junction transistor, and finally field effect transistors. Moreover application of diode as rectifier, clipper and clampers are studied in it. BJTs and FETs along with its biasing, types and configurations are studied in detail in the course. OP-AMP based circuits vastly used in different applications are studied.

**CataLog Data:** Course Code: EET\_121/B.Sc. Electrical Technology 2nd semester

Course Title: Basic Electronics

Credit Hours: 3

Course Designation: Core/Elective

Core

No of Sessions per week: 1 (Total 16 sessions)

Session Duration: 90 min

Compulsory/Elective Compulsory (Breadth)

**CataLog Description:** **EE\_121 Basic Electronics, Credits (3)**

Semiconductor Basics, Semiconductor Diodes, Diodes applications, Diode types, Bipolar junction transistors (BJT), Field effect transistors (FET), BJT and FET types, biasing, working principle, construction, applications, OP-AMP based circuits

**Prerequisite:** Linear Circuit analysis

**Prerequisites by**

**Topics:** NIL

**Co-requisite:** NIL

**Recommended Textbook:**

1. Thomas ,Floyd, “Electronic Devices Conventional current version”, 9th edition.

**References:**

2- Robert Boylested and Louis Nashelsky, “Electronics Devices and circuits Theory,” Ninth edition, 2006, Parentice Hall.

1. “Electronics devices and circuits”, By Theodore and Bogart 3rd edition**.**
2. Robert Paynter, “ Introductory Electronic devices and circuits: Electron Flow Version,” seventh edition, 2006, Parentice Hall.

**Course Learning Outcome (CLO):**

Upon successful completion of this course, the student will be able to describe the basics of semiconductor devices, PN junction, diodes and its models, analyze the diode application based circuits ,describe the basics of BJTs and its different configurations, describe the basics of FETs and its different configurations and study and analyze the OP-AMP based circuits like summer, differentiator, inverting and non-inverting configurations etc.

**Course Professional Outcome/ Industrial Usage:**

Course provides details and introduction to many basic semiconductor based components that have vast applications and usage from industrial perspective.

**Course Outline and Sessions Breakdown:**

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| **Topics covered in the course and level of coverage** | | Introduction to semiconductor theory, PN junction, Diode and its characteristics, breakdown voltage ,diode models , special purpose diode  (9 hours) |
| Diode applications: Rectifiers, clippers, clampers  (9 hours) |
| Introduction to BJT, characteristics and parameters, DC biasing, load line Q point  (9 hours) |
| BJT as an amplifier and as switch  BJT configurations CC CB CE  (6 hours) |
| Introduction to FETs, types, biasing techniques, configurations  ( 6 hours) |
| OP-AMP introduction, inverting ,non-inverting configurations  Summer, subtractor, differentiator ,comparator etc. OP-AMP based circuits  (6 hours) |
| **Course Contents** | **Detailed Contents** | |
| Semiconductor Devices, intrinsic and extrinsic materials, P-type and N-type materials | |
| PN junction , diode, diode models, diode forward and reverse x-istics, breakdown voltage | |
| Semiconductor Diodes: Photodiode, Schottky barrier diode, Zener diode | |
| Diode applications: Rectification  Half wave rectifier  Full wave center tapped rectifier | |
| Diode applications: Rectification  Full wave bridge rectifier | |
| Diode applications: Clippers series/parallel, clampers | |
| Basics of BJTs and working principle | |
| BJT characteristics and basic parameters | |
| Mid Exams | |
| DC biasing of BJT using voltage divider circuit , Load line and Q point | |
| BJT as an amplifier and as switch | |
| BJT configurations: CE, CB, CC configurations | |
| Basic of FET and working principle  FET types: JFET(N TYPE, P TYPE) , MOSFET( E-MOS, D-MOS) | |
| DC biasing of FET(JFET (self bias, voltage divider bias), MOSFET(drain feedback bias, voltage divider bias)) | |
| FET configurations; CD,CG,CS configurations and their comparison | |
| Introduction to OP-AMP inverting and non inverting configurations | |
| OP-AMP based circuits vastly used in different applications | |

**Computer Usage:** Not applicable unless otherwise stated.

**Projects Nil**

**Design Activities:** Students can be asked to solve an engineering problem from perspective of electronics theory

**Evaluation Criteria:** 1**.** Quizzes/assignments 20%

**2.** Mid-Term Exam 30%

**3.** Final Exam 50%

**Policies:**

1. No make up tests or quizzes, except in case of emergency, e.g. illness and accident. For make up tests, medical certificate is required and the instructor must be notified in advance of the test.
2. No late assignment will be accepted.