MECE 212 Electronics Circuits

1- Course code and title: MECE 212 Electronics Circuits

2- Credit hours: (2-2)3

3- Catalogue description: Semiconductor materials, PN junctions, Semiconductor diodes, Diode applications, Bipolar junction transistors (BJTs), DC biasing of BJTs, Field-effect transistors /FETs), FET biasing, BJT transistor modelling, BJT small signal analysis, BJT and FET networks, BJT and FET frequency responses, Operational amplifiers, Power amplifiers, Feedback and Oscillator circuits.

4- Prerequisite: MECE 211**,** PHYS 102

5- Coarse goals: This course is intended as the basic course in electronics circuits. It focuses on the analysis and design of semiconductor components such as diodes, transistors and operational amplifiers.

6- Coarse objectives: At the end of this course, students will be able to design and analyse all kinds of electrionics networks composed of semiconductor components such as diodes, BJT transistors, FET transistor and operational amplifiers.

7- Contribution to Mechatronics Engineering Program Objectivess: This course is one of the main courses for mechatronics engineering. It gives the students the ability to design and analyse electronics parts of the mechatronics systems and it also gives the ability to design and analyse electronics systems that are also main parts of the mechatronic systems. This course facilitates the design of digital systems, computer systems and computer controlled systems as well. The subjects given in this course are fundamuntal concepts for control system engineering that is also a prerequisite for the design of robotics and all kinds of mechatronic systems.

8- Relationship with other undergraduate and graduate courses: The subjects, concepts and modelling, formulation and solution methods are closely related to the contents of the courses of

MECE 211: Electrical Systems Analysis
MECE 305: Digital Systems
MECE 302: Mechatronic Components
MECE 308: Microcontrollers

9- Text books and reference boooks:

(1) Electronics Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky

(2) Lecture notes

10- Laboratory work required: The course is offered a set of laboratory experiments such as identification of semiconductor components such as diodes, BJT transistors, FET transistors, Linear ICs, also identification of measurement instruments such as voltmeter, ampermeter, powermeter, oscilloscope and signal generators, voltage and current measurements, power measurement, establishment of basic electronics circuits such as basic diode circuits like rectifiers, clippers, clampers etc, transistor circuits like common-base, common-emitter, common-collector configurations, practical OPAMP circuits.

11- Design projects: A design project is not required for this course

12- Syllabus:

Week	Topics
1	Introduction, Semiconductor materials, PN junction, Semiconductor diodes and diode equivalent circuits.
2	Diode applications such as rectifiers, clippers, and clampers.
3	Bipolar Junction Transistor (BJT); transistor construction, common-base, common-emitter and common-collector configurations, Transistor amplification action.
4	DC biasing of BJTs; Operating point , Fixed bias, Emitter-stabilized bias, DC bias vith voltage feedback, Bias stabilization, Practical applications.
5	Field Effect Transistors (FETs); Construction and characteristics of FETs, MOSFETS, VMOSs, CMOSs
6	FET Biasing; Biasing of FET transistors, Practical applications.
7	BJT Transistor Modeling; Amplification in AC domain, BJT transistor modeling, Important parameters.
8	BJT Small Signal Analysis; Common-Emitter fixed biasing, Voltage-divider bias, CE emitter-bias configuration, Emitter-follower configuration, Common-base configuration, Collector feedback configuration, Collector DC feedback configuration, Hybrid equivalent circuits, Practical applications.
9	FET Small Signal Analysis; FET small signal model, Fixed-bias, Self-bias, Voltage-divider, Source follower, Common-gate configurations, MOSFET configurations.
10	System Approach-Effects of R_s and R_L; Two-port systems, Effect of load empedance (R_L), Effect of source empedance (R_s), Combined Effect (R_s and R_L), BJT CE networtks, BJT Emitter-follower networks, BJT CB networks, FET networks, Cascaded systems.
11	BJT and FET Frequency Response; Decibel, Bode plots, Low frequency response of BJT amplifiers and FET amplifiers, High frequency response of BJT and FET amplifiers, Multi-stage frequency effects.
12	Operational Amplifiers (OPAMPs); Differential and common mode operation, Op-Amp basics, Practical Ap-Amp circuits, Op-Amp secifications and parameters, Op-Amp applications.
13	Power Amplifiers; Class A, B, C, and D amplifiers.
14	Feedback and Oscillator Circuits; Feedback concept, Practical feedback circuits, feedback amplifier, Oscillators of types phase-shift, Vien bridge, Tuned, Unijunction and Crystal.

13- Classroom and laboratory requirements: This course requires both a classroom and a laboratory activity.

14- assesment of course goals and Grading system:

Homeworks	10%
Midterm	30%
Final	40%
Laboratory work	20%

15- Faculty members who may be interested in teaching this course:
Dr. Sedat NAZLIBİLEK

16- Proposed semester for the course: Spring

17- Computer usage: 10%

18- Category content:

MBS (Math or Basic sciences):	30%
ES (Engineering science):	70%
SSH (Social sciences and History):	0%
D (Design):	0%

19 Prepared by: Dr. Sedat NAZLIBİLEK