INNOVATIVE TEACHING

Faculty Name / Subject / Topic	Summary of the Project	Reference Images and video link
Topic: (Metamaterial Monopole Antenna) Subject: Antenna and wave propagation **Dr.K Ramasamy** **Methodology: Project based demonstrative learning**	**Objective:** To help students learn antenna design from a practical viewpoint. The video speaks about the lab facility available for the students with a demonstration of the developed antenna in the department laboratory to motivate the students in research. The demonstrated flexible wearable KIT monopole antenna with metamaterial is fabricated on 1 mm-thick polydimethylsiloxane substrate to operate in the ISM frequency band of 2.45 GHz. Integration of the metamaterial improves the gain and reduces the specific absorption rate (SAR) of the antenna. The overall dimension of the antenna with the metamaterial is 49 × 49 × 19 mm^3. The designed antenna is investigated for the loading effect of the body by placing on the hand phantom model. The antenna performance can be analyzed for bending in x and y direction with various bend radii. Gain and SAR of the proposed antenna are 4.61 dBi and 0.868 W/kg. The results of the fabricated prototype show that the proposed wearable antenna is safe for biomedical applications. **Outcome:** Students can design and simulate a monopole antenna with metamaterial using HFSS software	**Video link:** https://youtu.be/vCkpjxwiq8Q 
Topic:(Rectifiers) Subject: **Electronics Circuits - I** **Dr. M. Sakthimohan** **Methodology: Virtual Simulation**	**Objective:**To assist students in learning the construction of half wave and full wave rectifiers from a practical perspective. In the study of electronic circuits, understanding the input and output characteristics of rectifiers is crucial. The Half and Full Wave Rectifiers serve as fundamental components in converting alternating current (AC) to direct current (DC). In this project, students are engaged in a comprehensive exploration of the input and output behaviors of these rectifiers. The goal is to gain a deep understanding of their operational principles and performance characteristics. 1. Investigation of the relationship between input AC voltage and input current in Half and Full Wave Rectifiers. 2. Analysis of peak inverse voltage (PIV) and its significance in selecting appropriate diodes for rectification. 3. Study of DC output voltage and current waveforms concerning variations in input AC voltage and load resistance.	**Video link:** https://youtu.be/hsMDwhbRxww 

	4. Calculation of ripple factor and efficiency to evaluate the effectiveness of rectification. **Outcome:** Using the Falstad online simulator, students can construct and simulate any kind of half wave and full wave rectifiers.	
Topic:(Vedic Multiplier) Subject:**VLSI DESIGN** **Mr. K. Yogeshwaran** **Methodology: Virtual Simulation**	**Objective:**To encourage the students in learning about the vedic multipliers from a practical perspective A 4 bit Vedic multiplier is designed using CMOS technology and MGDI technique. The performance of the system basically works better if the performance of the multiplier is good. In today's digital time, Multiplier is one which consumes power at the same time the speed of the multiplier plays a very important aspect in this. Multiplier Optimization for power and delay both will play an important role. Adders also play an important role in the multiplier. Here, we are using Ripple carry adders. In this project, the design is implemented using Cadence Virtuoso tool/Tanner EDA Tool employing gpdk 90nm technology. In this, we perform transient results along with parameters of Area, Delay and maximum power). **Outcome:** Students can design and simulate a vedic multiplier using EDA software tool.	**Video link:** **https://www.youtube.com/watch?v=2DVjeKfiGrs&t=23s** 

Topic:(RECTIFIERS) Subject::**Electronics Circuits - I** **Mr.S.Tamilselvan** **Methodology: Project based learning**	**Objective:**To assist students in learning the construction of half wave from a practical perspective Half-wave rectifiers transform AC voltage to DC voltage. A half wave rectifier circuit uses only one diode for the transformation. A half wave rectifier is defined as a type of rectifier that allows only one-half cycle of an AC voltage waveform to pass while blocking the other half cycle. . A half wave rectifier circuit consists of three main components as follows: ● A diode ● A transformer ● A resistive load **Outcome:** Students can design and simulate any kind of half wave rectifiers.	**Video link:** **https://youtu.be/4UXvs3qVCiA** 
TOPIC:(CMOS Inverter Design) **SUBJECT:VLSI DESIGN** **Dr.K Jayaram** **Methodology: Project based learning**	**Objective:**To facilitate students' practical understanding of CMOS design The CMOS inverter is the basic form of CMOS. It consists of 2 MOS-FETs: An N-channel on the “bottom” and a P-channel on top. They are connected with their gates together and their drains together. The N-channel has its source connected to ground, and the P-channel has its source connected to +power. The common gates are the input and are driven either high or low, + or ground. If the input is high, the N-channel is turned on, the P-channel is off, and their common drain output is low. If the input is set low, the output goes high with the P-channel on and the N-channel. The DSCH software is a logic editor and simulator. DSCH provides a user-friendly environment for hierarchical logic design, and fast simulation with delay analysis, which allows the design and validation of complex logic structures. The MICROWIND program allows the design and simulation of an integrated circuit at physical description level. The package contains a library of common logic and analog ICs to view and simulate.	**Video link:** **https://youtu.be/7iIwzSMLonw** 

	Outcome: Students can design and simulate a CMOS inverter effectively utilizing DSCH and Microwind software.	
TOPIC:(VSWR) **SUBJECT:Microwave Engineering** **Mr.P.Bala Subramani** **Methodology: Virtual Simulation**	**Objective:**To assist students in learning the construction of VSWR from a practical perspective. The Microwave Power measured is the average power at any position in the waveguide. Power measurement can be of three types. Measurement of Low power 0.01mWto10mW ,Example − Bolometric technique ,Measurement of Medium power 10mWto1W,Example − Calorimeter technique,Measurement of High power >10W,Example − Calorimeter Watt meter, Let us go through them in detail.The measurement of Microwave power around 0.01mW to 10mW, can be understood as the measurement of low power.Bolometer is a device which is used for low Microwave power measurements. The element used in the bolometer could be of positive or negative temperature coefficient. For example, a barrater has a positive temperature coefficient whose resistance increases with the increase in temperature. Thermistor has a negative temperature coefficient whose resistance decreases with the increase in temperature. **Outcome:** Students can design and simulate a VSWR in practical point of view.	**Video link:** https://youtu.be/sL8A07frV0c 
TOPIC:EMBEDDED PROGRAMMING) **SUBJECT:EMBEDDED REAL TIME SYSTEM** **Dr.N.Prakash** **Methodology: Virtual Simulation**	**Objective:**To help the students to learn, Embedded system design process. An embedded system is a special-purpose computer designed to perform one or a few dedicated functions, often with real time computing constraints. Embedded systems have become very important today as they control many of the common devices we use. An embedded microcontroller is a chip,which has a computer processor and all its support functions,memory (Both program and data) and I/O (including bus interfaces) built within the device.Embedded System Applications describes the latest techniques for embedded system design in a variety of applications. This also includes some of the latest software tools for embedded system design. **Outcome:**Students can design and simulate an Embedded i/o interfacing using Tinkercad.	**Video link:** https://www.youtube.com/watch?v=2__DpmDPFRM 

TOPIC:(Classification and detection using CNN**)** **SUBJECT:IMAGE PROCESSING** **R.Krishnaveni** **Methodology: Project based learning**	**Objective:**To encourage the students in learning about the CNN from a practical perspective. Diseases in dentals are i) Dental caries ii)Dental calculus iii) periodontal diseases iv) dental cracks. ML & DL are sub branches of AI. ML is used for numerical datas.DL is used for images.This experiment is used to detect various diseases using convolution neural network .It is one of the DL algorithm.It consists of input layer, hidden layer and output layer.It detects feature extraction of images and output of CNN algorithm is confusion matrix.It provides four values TP,TN,FP,FN to find the accuracy of algorithm. **Outcome:** Students can design and simulate a CNN by using Digital image processing with project based learning.	**Video link:** **https://youtu.be/fWoxg9a1UTM?si=4S8OxOitIh4b6zV6** 
TOPIC: Procedure for execution of C program for waveform execution **SUBJECT:Discrete Time Signal Processing** **Dr.A.Parimala Gandhi** **Methodology: Project based learning**	**Objective:**To assist students in learning the Procedure for execution of C program for waveform execution from a practical perspective. DSP Processors are advanced processors which has wide applications in the field of Audio signal processing, Video data compression, Computer graphics, Digital image processing, Speech processing, etc. Students got working knowledge about the TMS320C6713 processors with the use of Code Composer Studio3.1.Code Composer Studio includes an optimizing C/C++ compiler, source code editor, project build environment, debugger, profiler and many other features. The intuitive IDE takes each step of the application development flow. Familiar tools and interfaces make getting started simple. The basic arithmetic operations and the waveform generation programs were explained and executed through CCS3.1. The pictorial outputs were shown with the help of CRO **Outcome:** Students can design and simulate a c-program execution using DSP software	**Video link:** **https://youtu.be/fVOiPh1JCKw?si=hYGIxrCtWCZNPnR9** 

TOPIC:Monopole Antenna SUBJECT:Antenna and wave propagation **Dr.Sapna** **Methodology: Project based demonstrative learning**	**Objective:**To make the students understand antenna design on practical perspective The video demonstrates the antenna design and simulation using HFSS and testing the fabricated antenna using VNA. Demonstrative learning develops students' interest in the subject while focusing on research.The demonstrated antenna is a conformal monopole antenna for wearable application in ISM band frequency of 2.45GHz. The antenna has a return loss of 50.18dB with good radiation performance. The gain of the antenna is 1.09dBi which is improved to 3.28dBi using a metasurface consisting of 3×3 array elements. The metamaterial integrated antenna is fabricated on a 1mm thick flexible PDMS substrate. The metamaterial improves the gain while reducing the specific absorption rate (SAR) of the antenna. The SAR of the designed antenna is 0.285W/Kg at 10 mm spacing from the body. The geometry size of the metamaterial integrated antenna is $50\times50\times24mm^3$. The antenna is flexible and bendable whose performance is analyzed by bending the antenna with various radii in x and y direction. The antenna is suitable for biomedical applications in healthcare sectors. **Outcome:** Students will be able to design and simulate a monopole antenna using HFSS software.	**Video link:** **https://youtu.be/__Kgv1It8bw**