Course Code	DES130
Course Name	Introduction to Engineering Design
Credits	4
Course Offered to	Btech, 1st year
Course Description	Introduction to Engineering Design is a multidisciplinary course offered with an aim to ignite the young minds with concepts in design and innovation. The course is divided into 2 parts: At the beginning of the course, students need to submit their project ideas and group members. To be able to do so, in the previous semester students have been instructed to form groups and to think about a possible project idea preferably having a social impact. Within the first week they are exposed to the basics of project planning and management allowing them to design and implement a feasible plan and time line for their project for which the students are supported with seed money from the institute. Later students are introduced to microcontrollers such as Raspberry Pi and Arduino including their development environments (IDE) to rapidly prototype their project ideas. This part of the course concludes with topics about digital and analogue sensors and communication protocols such as UART, SPI, 1-Wire and I2C. Further, example data sheets are discussed allowing the student to choose the right devices for their project. The second part of the course is dedicated to project realization. In regular intervals reports are filed and discussed to check the progress and for advice. The course completes with a showcase in which the functionality of the project is demonstrated.

Pre-requisites		
Pre-requisite (Mandatory)	**Pre-requisite (Desirable)**	**Pre-requisite(other)**
Introduction to Programming Digital Circuits System Management		

*Please insert more rows if required

Post Conditions*(For suggestions on verbs please refer the second sheet)			
CO1	**CO2**	**CO3**	**CO4**
Exposure to communication protocols commonly used in embedded systems	Understanding of sensors and actuators interacting with the physical world	Able to plan, design and develop prototypes using a microcontroller	

Weekly Lecture Plan			
Week Number	**Lecture Topic**	**COs Met**	**Assignment/Labs/Tutorial**
1	Course logistics, Introduction to project management and milestones	C03	Report (day 1): Project submission in the prescribed format. Based on their idea, a faculty mentor is selected Lab: Introduction, maintenance and safety precautions for the workshop with practical examples. Report: Milestones and plan for the chosen project

2	Criteria to select a microcontroller, Arduino microcontroller and its IDE	C03	Lab: Introduction, maintenance and safety precautions for the workshop with practical examples. (2nd part) Report: Selection of microcontroller
3	Continuation of “Arduino microcontroller and its IDE”, Setting up a Raspberry Pi	C03	Assignment: Arduino IDE
4	Accessing ports on Raspberry Pi using python, Introduction to MIT App Inventor (http://appinventor.mit.edu) for rapid prototyping of apps for Android smartphones	C03, C01	Assignment: Control the GPIO of a Raspberry Pi
5	Continuation of “Introduction to MIT App Inventor”, Analog and digital sensors (temperature, GPS, IR, ultrasonic, light intensity, accelerometer, etc)	C03, C02	Assignment: Implementation of a simple game using the MIT App Inventor
6	Continuation of “Analog and digital sensors”, Introduction into communication protocols: UART, I^2C, SPI, 1-Wire	C03, C02	Assignment: Connect analog and digital sensors to the Arduino Assignment: Acquiring of hardware for approved project reports Report: Block diagram and connections of the project
7	Data sheets, current and voltages, Actuation and H-bridges	C03, C02, C01	Assignment: Acquiring of hardware for approved project reports Report: Refinement of previous report based on mentor input
8-13	Project realization mentored by designated faculties.	C03, C02, C01	Report: Milestone progress every week
	Demonstration of the final project		

*Please insert more rows if required

Weekly Lab Plan

Week Number	Laboratory Exercise	COs Met	Platform (Hardware/Software)
1-2	Lab: Introduction, maintenance and safety precautions for the workshop with practical examples.	C03	Workshop
3	Assignment: Arduino IDE	C03	Arduino
4	Assignment: Control the GPIO of a Raspberry Pi	C03, C02	Raspberry Pi
5	Assignment: Implementation of a simple game using the MIT App Inventor	C03	Android
6	Assignment: Connect analog and digital sensors to the Arduino Assignment: Acquiring of hardware for approved project reports	C03, C01	Arduino
7	Assignment: Acquiring of hardware for approved project reports	C03	

*Please insert more rows if required

Assessment Plan	
Type of Evaluation	% Contribution in Grade
Assignments	15
Mid Term Exam	20
Reports	15
Final Lab Exam	40
Attendance/Quizzes	10

*Please insert more row for other type of Evaluation

Resource Material	
Type	**Title**
Various Internet Resources	