1. Course Number and Name: 320 CPE – Micro Controller Design

2. Credits and Contact Hours: 3 Credit

a. Lecture – 2 day per week at 50 minutes for 16 weeks
b. Laboratory – 1 day per week at 100 minutes for 16 weeks

3. Course Coordinator or Instructor:

Dr.JamelBaili

4. Text Book:

- The 8051 Microcontroller BasedEmbedded Systems-Manish K Patel, Mc Grw Hill, 2014.
- 8051 Microcontroller Sampath K. Venkatesan S. K. Kataria and Sons.
- John Crisp, Introduction to microprocessors and Microcontrollers, 2nd Edition.

5. Specific Course Information:

a. **Catalog Description:** The use of microcontrollers is expanding rapidly in all most all fields including instrumentation, control, communication, medical instruments etc. The course is designed to cover architecture, hardware and software, programming, interfacing, communication and application engineering etc.

b. **Prerequisites:** 310 CPE Embedded and Real time Systems

c. **Status:** Required

6. Specific Goals for the Course:

a. Course Outcomes:

1. Define the fundamental principles of microcontroller design
2. Develop an ability to design a microcontroller design, components to meet desired needs
3. Develop an ability to design and conduct experiments on 8051 microcontroller to analyze and interpret input/output.
4. Explain key impact of microcontroller solutions in a global, economic and societal context.
5. Explain the techniques, skills and tools necessary for microcontroller practice
6. Use the discussion and participation during the lectures to improve knowledge of technical skills for a microcontroller
7. Demonstrate and ability to think analytically and critically to design a system using microcontroller.

b. Student outcomes in Criterion 3 addressed by course:

Course LOs #	Map course LOs with the program LOs. (Place course LO #s in the left column and Student LO #s across the top.)											
	Student Learning Outcomes Use LOs Codes											
	a1	**a2**	**b1**	**b2**	**b3**	**b4**	**c1**	**c2**	**c3**	**c4**	**d1**	**d2**
1	√											
2				√								
3					√							
4						√						
5							√					
6								√				
7									√			

7. List of Topics: 320CPE – Micro Controller Design

List of Topics for Theory:

- **Introduction to Microcontrollers:** General Architecture for microcontroller, 8 Bit microcontrollers, Criteria for choosing microcontroller, Architecture of 8051 microcontroller, Pin details of 8051, Register set of 8051.
- **Assembly Language Programming:** Instruction set of 8051, Data transfer instructions – Different addressing modes – Arithmetic Instructions– Logic and Compare instructions – Rotate instruction and data serialization – BCD, ASCII – Loop and jump instructions – Call instructions– Sample programs. I/O Port programming.
- **Timer/Counter Programming:** Mode 1& mode 2 Programming, Steps to Mode 1 Program, Timer mode Register (TMOD), TCON Register, Accessing Timer Registers.
- **Serial Port Programming:** Basics of serial communication, Half and full duplex communication, Start and stop bits, Data transfer rate, RS 232 standards, Data communication classification, RS232 pins, 8051 connection to RS232,SBUF Register, Programming Serial Data Transmitting, Doubling Baud Rate.
- **Display Interfacing:** 7 Segment Display Interface, LCD Interfacing: LCD Pin Descriptions, Sending Codes and Data to LCDs, Sending Information to LCD using MOVC, keyboard interfacing, Grounding Rows and Reading Columns, LCD Command Codes, interfacing LCD to 8051
- **Switch Interfacing:** Keyboard interfacing - Scanning and Identifying the Key, Grounding Rows and Reading Columns, Flowchart for Program.
- **Real world Interfacing:** ADC, DAC, Sensors Interface - ADC Devices, ADC804 Chip, Testing ADC804, ADC804 Clock from 8051 XTAL2, Interfacing Temperature Sensor, LM34 and LM35 Temperature Sensors, Signal Conditioning and Interfacing LM35, Steps to Program ADC808/8090.
- **Motors Interfacing:** DC Motor, Stepper Motor - Programming the 8255, Address Aliases, 8051 System with 8255, Stepper Motor Connection To The 8255, LCD Connection To The 8255, interfacing of stepper motor with 8051,Characteristics DC motor, DC motor connection with 8051, Applications.

List of Topics for Laboratory:

- Introduction to 8051 Microcontroller Development Board, Kiel and Proteus VSM
- Programs based on data transfer, Arithmetic and logic instructions
- Interfacing Switches & LEDs using 8051 Microcontroller
- Interfacing DC-Motor using 8051 Microcontroller
- Design & implement a 4-bit counter using 8051 Microcontroller
- Interfacing 7-Segment Display using 8051 Microcontroller
- Interfacing switch and relay using 8051 Microcontroller
- Interfacing Stepper Motor using 8051 Microcontroller
- Interfacing LCD using 8051 Microcontroller
- Interfacing D/A converter using 8051 Microcontroller
- Serial programming using 8051 Microcontroller