UNIVERSITY OF RAJSHAHI

Faculty of Engineering

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Course Curriculum
B.Sc. Engineering
Session: 2020–2021

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Courses offered in Part-III, Even Semester

Code	Course Title	Marks	Credit
CSE3211	Project Planning & Management	75	3
CSE3221	Digital Signal Processing	75	3
CSE3222	Digital Signal Processing Lab	25	1
CSE3231	Microprocessor and Assembly Language	75	3
CSE3232	Microprocessor and Assembly Language Lab	25	1
CSE3241	Operating Systems	75	3
CSE3242	Operating Systems Lab	25	1
CSE 3251	Computer Networks	75	3
CSE 3252	Computer Networks Lab	25	1
	Total	475	19

Courses offered in Part-IV, Odd Semester

Code	Course Title	Marks	Credit
CSE4111	Parallel Processing and Distributed System	75	3
CSE4112	Parallel Processing and Distributed System Lab	25	1
CSE4121	Object Oriented Design and Design Patterns	50	2
CSE4122	Object Oriented Design and Design Patterns Lab	25	1
CSE4131	Artificial Intelligence	75	3
CSE4132	Artificial Intelligence Lab	25	1
CSE4141	Microprocessor Interfacing and Microcontrollers	75	3
CSE4142	Microprocessor Interfacing and Microcontrollers Lab	25	1
Option I (T)	Theory: Should be selected from Table-I	75	3
Option I (L)	Lab course based on Option-I (T)	25	1
CSE4192	Thesis/ Project (Part I)	25	1
	Total	500	20

3rd Year (Even Semester)

Proposal

CSE 3231: Microprocessor and Assembly Language
Credits: 3 **Contact Hours:** 39
Year: Third **Semester:** Even

Prerequisite: CSE2111: Digital System Design, CSE2231: Computer Architecture and Organization
Course Type ☒ Theory ☐ Laboratory work ☐ Project work ☐ Viva Voce
Motivation To develop knowledge on Microprocessor and Microcontroller architecture and programming skills with STM32 microcontroller

Course Objective:
This course introduces engineering students with the 8085/8086 Microprocessors, ARM processor and their programming. The course mainly is focused on Cortex M3/M4 processor and will provide a good understanding of its architecture, register sets, instruction sets, operation modes, addressing modes, memory system, Interrupts. However, this course will also give a brief introduction of older 8085/8085 processors.

Course Outcomes (COs), Program Outcomes (POs) and Assessment:

CO No.	CO Statement	Corresponding PO	Domain / level of learning taxonomy	Delivery methods and activities	Assessment tools
CO1	To **identify** the basics knowledge of the architecture of 8086/8085 microprocessors.	**Engineering knowledge** (PO1)	Cognitive domain – level 6	☒ Lecture Note ☒ Text Book ☐ Audio/Video ☐ Web Material ☐ Journal paper	☐ Class Test ☐ Final Exam ☐ Assignment ☐ Participation ☒ Presentation
CO2	To **identify** the architecture and programming model of Cortex M3/M4 processor	**Engineering knowledge** (PO1)	Cognitive domain – level 6	☒ Lecture Note ☒ Text Book ☐ Audio/Video ☐ Web Material ☐ Journal paper	☐ Class Test ☐ Final Exam ☐ Assignment ☐ Participation ☒ Presentation
CO3	To **apply** earned knowledge for STM32F4xx programming	**Design/Development of Solutions** (PO3)	Cognitive domain – level 4	☒ Lecture Note ☒ Text Book ☐ Audio/Video ☐ Web Material ☐ Journal paper	☐ Class Test ☐ Final Exam ☐ Assignment ☐ Participation ☒ Presentation

Assessment and Marks Distribution:
Students will be assessed on the basis of their overall performance in all the exams, class tests, assignments, and class participation. Final numeric reward will be the compilation of:

Class tests + Assignments due in different times of the semester (20%)
A comprehensive final exam (70%), Total Time: 3 hours.
A class participation mark (10%).

Course Contents:

Microprocessor Fundamentals: Architecture of a microprocessor, Architecture of Intel 8085 Microprocessor. Architecture of Intel 8086 Microprocessor, its execution unit and bus-interface unit, its registers and flags. Programming model of 8086 processor

Programmers model of Cortex®-M3 processor, Processor mode and privilege levels for software execution, Stacks, Core registers, Exceptions and interrupts, Data types,

Memory model of Cortex®-M3 processor, Memory regions, types and attributes, Memory system ordering of memory accesses, Behavior of memory accesses, Software ordering of memory accesses, Bit-banding, Memory endianness, Synchronization primitives,

Exception model, Exception types, Exception handlers, Exception priorities. Power management, Entering sleep mode, Wakeup from sleep mode. Power management programming hints

The Cortex®-M3 instruction set, Intrinsic functions, Operands, Shift operations, Address alignment, Conditional execution, The condition flags, Condition code suffixes, Instruction width selection, Memory access instructions, General data processing instructions, Memory protection unit (MPU).

Sources:

1. STMicroelectronics www.st.com : **STM32F101xx, STM32F102xx, STM32F103xx and STM32F105xx/STM32F107xx Reference manual** *(RM0008)*
   STM32F10xxx Cortex®-M3 programming manual *(PM0056)*
   STM32F10xxx Flash memory programming manual *(PM0075*)
   STM32F10xxx XL-density Flash memory programming manual *(PM0068*)

Books Recommended:

1. Ytha Yu and Charlers Marut : **Assembly Language Programming and Organization of the IBM PC,** *McGraw- Hill*
2. Ramesh Goanker : **Microcomputer Interfacing,** *McGraw-Hill*

CSE 3232: Microprocessor and Assembly Language Lab
Credits: 1 Contact Hours: 26
Year: Third **Semester:** Even

Prerequisite: CSE2111: Digital System Design, CSE2231: Computer Architecture and Organization
Course Type ☐ Theory ☒ Laboratory work ☐ Project work ☐ Viva Voce
Motivation To develop knowledge on microprocessor architecture and programming skill in assembly language for real world applications.

Course Objective:
The main objective of this lab course is STM32F4xx programming based on theory course CSE3231 (Microprocessor and Microcontroller) using MDK-ARM programming environment.

Course Outcomes (COs), Program Outcomes (POs) and Assessment:

CO No.	CO Statement	Corresponding PO	Domain / level of learning taxonomy	Delivery methods and activities	Assessment tools
CO1	**To solve** Memory access tasks	**Design/development of solutions:** (PO3)	Cognitive domain – level 4	☐ Lecture Note ☒ Text Book ☐ Audio/Video ☐ Web Material ☒ Lab Manual	☒ CA ☒ Final Exam ☐ Assignment ☒ Note book ☒ Presentation
CO2	**To solve** Data processing tasks	**Design/development of solutions:** (PO3)	Cognitive domain – level 4	☐ Lecture Note ☒ Text Book ☐ Audio/Video ☐ Web Material ☒ Lab Manual	☒ CA ☒ Final Exam ☐ Assignment ☒ Note book ☒ Presentation

Assessment and Marks Distribution:
Students will be assessed on the basis of their overall performance in all the exams, class tests, assignments, and class participation. Final numeric reward will be the compilation of:

Class tests + Assignments due in different times of the semester (20%)
A comprehensive final exam (70%), Total Time: 3 hours.
A class participation mark (10%).

Lab Course Contents/List of Experiments:

1. Introduction to MDK-ARM programming environment. MDK Tools, Software Packs, MDK Editions. Software Components, Create Applications (https://www.keil.com/download/product/)
2. Programming with memory access instructions
3. Programming with general data processing instructions
4. Programming for memory protection unit

4th Year (Odd Semester)

Proposal

CSE 4141: Microprocessor Interfacing and Microcontrollers
Credits: 3 **Contact Hours:** 39
Year: Fourth **Semester:** Odd

Prerequisite: CSE2111: Digital System Design, CSE3231: Microprocessor and Assembly Language
Course Type ☒ Theory ☐ Laboratory work ☐ Project work ☐ Viva Voce
Motivation To develop hardware knowledge and programming skills on STM32F4xx microcontroller interfacing

Course Objective:
The main objective of this course is to provide knowledge on basics of interfacing techniques, interfacing devices and finally, to make the student understand on critical programming techniques for STM32F4xx microcontroller so that they can develop engineering skills in designing real world applications.

Course Outcomes (COs), Program Outcomes (POs) and Assessment:

CO No.	CO Statement	Corresponding PO	Domain / level of learning taxonomy	Delivery methods and activities	Assessment tools
CO1	To **identi**fy the basics knowledge required for interfacing, interfacing devices	**Engineering knowledge** (PO1)	Cognitive domain – level 6	☒ Lecture Note ☒ Text Book ☐ Audio/Video ☒ Web Material ☐ Journal paper	☒ Class Test ☒ Final Exam ☐ Assignment ☐ Participation ☒ Presentation
CO2	To **apply** knowledge for real world application using STM32F4xx microcontroller	**Design/Development of Solutions** (PO3)	Cognitive domain – level 4	☒ Lecture Note ☒ Text Book ☐ Audio/Video ☒ Web Material ☐ Journal paper	☒ Class Test ☒ Final Exam ☐ Assignment ☐ Participation ☒ Presentation
CO3	To **explain** the use of STM32F4xx microcontroller for real world applications.	**Problem Analysis** (PO2)	Cognitive domain – level 5	☒ Lecture Note ☒ Text Book ☒ Audio/Video ☒ Web Material ☐ Journal paper	☒ Class Test ☒ Final Exam ☐ Assignment ☐ Participation ☒ Presentation

Assessment and Marks Distribution:
Students will be assessed on the basis of their overall performance in all the exams, class tests, assignments, and class participation. Final numeric reward will be the compilation of:
Class tests + Assignments due in different times of the semester (20%)
A comprehensive final exam (70%), Total Time: 3 hours.
A class participation mark (10%).

Course Contents:

Peripheral I/O and memory mapped I/O, Interfacing with external memory, microprocessor-controlled data transfer and peripheral controlled data transfer, commercial AD and DA converter, ADC 0809, Flash ADC, ADC 0820. 8255 Programmable peripheral interfaces, its different mode of operation. Application of 8259, 8257

STM32F4xx microcontroller architecture, Memory organization, Memory map, CRC calculation unit, Power control (PWR).

STM32 core peripherals and programming, MPU access permission attributes, MPU mismatch, Updating an MPU region, MPU design hints and tips

Nested vectored interrupt controller (NVIC), Level-sensitive and pulse interrupts, NVIC design hints and tips, NVIC register map. System control block (SCB), SysTick timer (STK).

Introduction of different types of Timers, General-purpose timers (TIM2 to TIM5), General-purpose timers (TIM9 to TIM14) of STM32F4xx microcontroller.

Architecture and Programming of Analog-to-digital converter (ADC) of STM32F4xx microcontroller.

Concepts and programming of Universal synchronous asynchronous receiver transmitter (USART), Serial peripheral interface (SPI), Inter-integrated circuit (I2C) interface of STM32F4xx microcontroller

Sources:

1. STMicroelectronics www.st.com : **STM32F101xx, STM32F102xx, STM32F103xx and STM32F105xx/STM32F107xx Reference manual** *(RM0008)*
   STM32F10xxx Cortex®-M3 programming manual *(PM0056)*
   STM32F10xxx Flash memory programming manual *(PM0075*)
   STM32F10xxx XL-density Flash memory programming manual *(PM0068*)

Books Recommended:

1. Ramesh Goanker : **Microcomputer Interfacing,** *McGraw-Hill*

CSE 4142: Microprocessor Interfacing and Microcontrollers Lab
Credits: 1 Contact Hours: 26
Year: Fourth Semester: Odd

Prerequisite: CSE2111: Digital System Design, CSE3231: Microprocessor and Assembly Language
Course Type ☐ Theory ☒ Laboratory work ☐ Project work ☐ Viva Voce
Motivation To develop hardware knowledge and microcontroller programming skills for interfacing and apply that knowledge for the real-world applications.

Course Objective:
To enable the interconnection and integration of the physical world with digital devices, STM32F4xx microcontroller, Arduino development board, and to give core concepts of IoT. The hands-on lab work is focused on programming of STM32F4xx microcontroller for interfacing.

Course Outcomes (COs), Program Outcomes (POs) and Assessment:

CO No.	CO Statement	Corresponding PO	Domain / level of learning taxonomy	Delivery methods and activities	Assessment tools
CO1	To **apply** knowledge for real world applications targeting STM32F4xx microcontroller	**Modern tool usage:** (PO5)	Cognitive domain – level 4	☐ Lecture Note ☒ Text Book ☐ Audio/Video ☒ Web Material ☒ Lab Manual	☒ CA ☒ Final Exam ☒ Assignment ☒ Note book ☒ Presentation
CO2	To **apply** knowledge for real world applications using STM32F4xx microcontroller	**Design/development of solutions:** (PO3)	Cognitive domain – level 4	☐ Lecture Note ☒ Text Book ☐ Audio/Video ☒ Web Material ☒ Lab Manual	☒ CA ☒ Final Exam ☒ Assignment ☒ Note book ☒ Presentation

Assessment and Marks Distribution:
Continuous Assessments (CA) (20%)
A comprehensive final exam + Lab note book (70%)
A class participation mark (10%).

Lab Course Contents/List of Experiments:

1. Survey on MCU components GPIO port and registers of STM32F4xx microcontroller.

2. Write program to use GPIO for general purpose I/O, enable GPIO clock (RCC AHB1 Enable Register), Mode Register, Output type and register (Push-pull/Open Drain), Speed Register, Pull-up/Pull-down-Resistor, GPIO port set and Reset register, Alternate function and Alternate Function register
3. Program two GPIO pins for input, Program four GPIO pins for output (use 4 LED)
4. Programming for Nested vectored interrupt controller (NVIC) of STM32F4xx microcontroller,
5. Programming for Analog-to-digital converter of STM32F4xx microcontroller.
6. Programming for Timers
7. Programming for Universal synchronous asynchronous receiver transmitter (USART).
8. Demonstration of Servo motor Control Shield with Auduino