B. Eng. Tech. Projects (FYP @FKTEN)

General Requirements

Note: These are MY requirements - to those who are interested doing their projects under MY supervision.

Recommended development platform for all projects is Linux. I personally use and recommend Slackware. Devuan is also a good option. Projects that involve source codes (e.g. HDL, C, C++) are **required** to use source code management (SCM) software (git).

General Comments

Update20171217 Beginning 2018, I will set milestones (i.e. mini-objectives) for each project title. I figure this would be a better way for students to actually see what I expect them to achieve while working on the project. My previous way of using scopes does not seem to work - although I thought that would make it more flexible on the outcome of the project.

Note: The following explains my previous method of describing projects. I'm keeping this around for now, but only for personal record. Students no longer need these.

For each project title, I've included some keywords, objective(s) and scope. The keywords are there for you to do some background research before you jump into this - I don't want you to give-up on me (it's a waste of everybody's time) towards the end of the project. I put in objectives and scope to let you know what is expected out of this project. So, your results will be based on these expectations.

I define an objective as the targeted final result. I usually set only ONE primary objective and optionally a secondary objective that will/should not affect your final results (though it usually gives you extra marks if completed) - too many objectives usually leads to unsatisfactory results. Meanwhile, scope visualizes how much work is expected - for example, one can say that the primary objective is to design an 8-bit microprocessor. So, the scope should mention maybe something like you're expected to produce schematics with instruction set that covers data transfer/processing and program control, complete with logic simulation results.

1. Development of a Vision-based Vehicle Registration Identification System ° Description: This project is mainly software development, with real hardware implementation (Raspberry Pi platform). The main target is to implement vision-based vehicle registration identification system on real hardware. Implementation MUST BE written based on my1imgpro library (i.e. libraries like OpenCV cannot be used). *Warning:* This project requires purchases of components/modules that may not be reimbursed by the department. ° Keyword(s): vision system, image processing ° Pre-requisite: Computer Programming, Image Processing ° Objective: To develop a Vehicle Registration Identification System Milestone 1: Implemented algorithm for vehicle registration plate detection Milestone 2: Implemented algorithm for character recognition (identification) Milestone 3: Implemented system on real hardware (Raspberry Pi platform) DIGITAL SYSTEM DESIGN

SYSTEM DEVELOPMENT

Implementation of RISC-V Core on FPGA

Description: This is a design project to implement a working microprocessor based on the RISC-V ISA. It involves writing HDL (Hardware Description Language) codes and simulating it on a simulation software. The final implementation needs to be fully tested and subsequently be improvised (if possible). **Warning:** An existing implementation is already available on the internet. Evaluation for this project will be based on progress - you need to show that you implement this on your own.

Keyword(s): RISC-V, FPGA, reconfigurable computing, microprocessor softcore

Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture

Objective: To implement custom RISC-V core on FPGA

Scope:

Milestone 1: Completed basic core @RV32I (at least data movement and ALU)

Milestone 2: Verified core functionality using simulation

Milestone 3: Performed testing on FPGA hardware

2.

Implementation of 8051-Binary-Compatible Core

Description: This is a design project to implement a working 8051-binary-compatible core. A similar implementation for 8085 microprocessor is available here. It involves writing HDL (Hardware Description Language) codes and simulating it on a simulation software like ModelSim. The final implementation needs to be fully tested and subsequently be improvised (if possible). **NOTE:** An existing implementation is already available on the internet. Evaluation for this project will be based on progress - you need to show that you implement this on your own.

Keyword(s): 8051, FPGA, reconfigurable computing, microcontroller softcore

Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture

Objective: To implement 8-bit microcontroller core (8051 clone) on FPGA

Milestone 1: Completed Instruction Decoding for ALL 8051 instructions

Milestone 2: Completed State Machine for 8051 Instruction Fetch and Execution

Milestone 3: Completed Testbench for 8051-Binary-Compatible Core

0

^

SYSTEM DEVELOPMENT

Development of an Autonomous Mobile Robot Platform

Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. *Warning:* This project requires purchases of components/modules that may not be reimbursed by the department.

Keyword(s): microcontrollers, mobile robots, autonomous navigation

Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System

Objective: To develop a mobile robot platform with basic navigation features

Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller)

Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn)

Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance) 2.

Smart Farm Irrigation System Monitoring and Control

Description: This is a hands-on project that may be used at UniMAP's Institute of Sustainable Agro-Technology (INSAT). Initial work involves developing a system that needs to control irrigation of a small plot, and monitor temperature and possibly water usage. All data will be sent to a centralized data center for the whole farm. **Warning:** This project requires purchases of components/modules that may not be reimbursed by the department.

Keyword(s): microcontroller, embedded system, data server

Pre-requisite(s): Microcontrollers/Embedded System Development

Objective: To develop an irrigation system monitoring and control platform

Milestone 1: Develop valve control system (timer & manual override)

Milestone 2: Develop monitoring & control application (can be web-based OR desktop)

Milestone 3: Produce a simple profiling system (e.g. water usage, temperature/humidity) 3.

Development of a Vision-based Vehicle Registration Identification System

Description: This project is mainly software development, with real hardware implementation (Raspberry Pi platform). The main target is to implement vision-based vehicle registration identification system on real hardware. Implementation MUST BE written based on mylimgpro library (i.e. libraries like OpenCV cannot be used). **Warning:** This project requires purchases of components/modules that may not be reimbursed by the department.

Keyword(s): vision system, image processing

Pre-requisite: Computer Programming, Image Processing

Objective: To develop a Vehicle Registration Identification System

Milestone 1: Implemented algorithm for vehicle registration plate detection

Milestone 2: Implemented algorithm for character recognition (identification)

Milestone 3: Implemented system on real hardware (Raspberry Pi platform)

o

o

SYSTEM DEVELOPMENT DIGITAL SYSTEM DESIGN

Implementation of 8051-Binary-Compatible Core

Description: This is a design project to implement a working 8051-binary-compatible core. A similar implementation for 8085 microprocessor is available here. It involves writing HDL (Hardware Description Language) codes and simulating it on a simulation software like ModelSim. The final implementation needs to be fully tested and subsequently be improvised (if possible). **NOTE:** An existing implementation is already available on the internet. Evaluation for this project will be based on progress - you need to show that you implement this on your own.

Keyword(s): 8051, FPGA, reconfigurable computing, microcontroller softcore

Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture

Objective: To implement 8-bit microcontroller core (8051 clone) on FPGA

Milestone 1: Completed Instruction Decoding for ALL 8051 instructions

Milestone 2: Completed State Machine for 8051 Instruction Fetch and Execution

Milestone 3: Completed Testbench for 8051-Binary-Compatible Core

Description: This project is mainly software development, with real hardware implementation (Raspberry Pi platform). The main target is to implement vision-based vehicle registration identification system on real hardware. Implementation MUST BE written based on my lingpro library (i.e. libraries like OpenCV cannot be used). Warning: This project requires purchases of components/modules that may not be reimbursed by the department. Keyword(s): vision system, image processing Pre-requisite: Computer Programming, Image Processing Objective: To develop a Vehicle Registration Identification System Milestone 1: Implemented algorithm for vehicle registration plate detection Milestone 2: Implemented algorithm for character recognition (identification) Milestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. Keyword(s): microcontrollers, mobile robots, autonomous navigation Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance) Distrat EYSTEM DESIGN	1. Development of a Vision-based Vehicle Registration Identification System
Keyword(s): vision system, image processing Pre-requisite: Computer Programming, Image Processing Objective: To develop a Vehicle Registration Identification System Milestone 1: Implemented algorithm for vehicle registration plate detection Milestone 2: Implemented algorithm for character recognition (identification) Milestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. * Keyword(s): microcontrollers, mobile robots, autonomous navigation Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance) Diciti A SYSTEM DESIGN	Description: This project is mainly software development, with real hardware implementation (Raspberry Pi platform). The main target is to implement vision-based vehicle registration identification system on real hardware. Implementation MUST BE written based on my1imgpro library (i.e. libraries like OpenCV cannot be used). Warning: This project requires purchases of components/modules that may not be reimbursed by the department.
Pre-requisite: Computer Programming, Image Processing Objective: To develop a Vehicle Registration Identification System Milestone 1: Implemented algorithm for vehicle registration plate detection Milestone 2: Implemented algorithm for character recognition (identification) Milestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. * Keyword(s): microcontrollers, mobile robots, autonomous navigation Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance) DECITAL SYSTEM DESIGN	Keyword(s): vision system, image processing
Objective: To develop a Vehicle Registration Identification System Milestone 1: Implemented algorithm for vehicle registration plate detection Milestone 2: Implemented algorithm for character recognition (identification) Milestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. * Veyword(s): microcontrollers, mobile robots, autonomous navigation * Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Pre-requisite: Computer Programming, Image Processing
Milestone 1: Implemented algorithm for vehicle registration plate detection Milestone 2: Implemented algorithm for character recognition (identification) Milestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. * * * * * * * * * * * * *	Objective: To develop a Vehicle Registration Identification System
Milestone 2: Implemented algorithm for character recognition (identification) Milestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. Keyword(s): microcontrollers, mobile robots, autonomous navigation Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Milestone 1: Implemented algorithm for vehicle registration plate detection
Milestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform Oescription: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. * Keyword(s): microcontrollers, mobile robots, autonomous navigation * Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System * Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance) DIGITAL SYSTEM DESIGN	Milestone 2: Implemented algorithm for character recognition (identification)
Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Milestone 3: Implemented system on real hardware (Raspberry Pi platform)
Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department.	Development of an Autonomous Mobile Robot Platform
Keyword(s): microcontrollers, mobile robots, autonomous navigation Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department.
Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Keyword(s): microcontrollers, mobile robots, autonomous navigation
Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System
Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Objective: To develop a mobile robot platform with basic navigation features
Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller)
Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn)
	Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)
	DIGITAL SYSTEM DESIGN

SYSTEM DEVELOPMENT

Implementation of RISC-V Core on FPGA

Description: This is a design project to implement a working microprocessor based on the RISC-V ISA. It involves writing HDL (Hardware Description Language) codes and simulating it on a simulation software. The final implementation needs to be fully tested and subsequently be improvised (if possible). **Warning:** An existing implementation is already available on the internet. Evaluation for this project will be based on progress - you need to show that you implement this on your own.

Keyword(s): RISC-V, FPGA, reconfigurable computing, microprocessor softcore

Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture

Objective: To implement custom RISC-V core on FPGA

Scope:

Milestone 1: Completed basic core @RV32I (at least data movement and ALU)

Milestone 2: Verified core functionality using simulation

Milestone 3: Performed testing on FPGA hardware

2. Implementation of 8051-Binary-Compatible Core

Description: This is a design project to implement a working 8051-binary-compatible core. A similar implementation for 8085 microprocessor is available here. It involves writing HDL (Hardware Description Language) codes and simulating it on a simulation software like ModelSim. The final implementation needs to be fully tested and subsequently be improvised (if possible). **NOTE:** An existing implementation is already available on the internet. Evaluation for this project will be based on progress - you need to show that you implement this on your own.

Keyword(s): 8051, FPGA, reconfigurable computing, microcontroller softcore

Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture

Objective: To implement 8-bit microcontroller core (8051 clone) on FPGA

Milestone 1: Completed Instruction Decoding for ALL 8051 instructions

Milestone 2: Completed State Machine for 8051 Instruction Fetch and Execution

Milestone 3: Completed Testbench for 8051-Binary-Compatible Core

SYSTEM DEVELOPMENT 1. Development of an Automated Storage and Retrieval System Description: This project is a combination of hardware/software development. It requires the student to develop a small-scale storage/retrieval system (refer to **1** this). Of course, a management software for the system is also expected. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. 0 Keyword(s): microcontrollers, warehouse management, automated storage retrieval system, asrs Pre-requisite(s): Microcontrollers/Embedded System, Programming Objective: To develop an automated storage/retrieval system and its management system Milestone 1: Produced a model for storage/retrieval system (at least $32 - 4 \times 4$ on both sides) Milestone 2: Developed software for basic storage/retrieval Milestone 3: Developed a simple warehouse management software 2. **Development of a Battery-powered Tracking Module with Monitoring System** Description: This project is a combination of hardware/software development. It requires the student to produce a low-power tracking module using microcontroller (both hardware and software development involved). The Monitoring System software can be modified from an existing system provided. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. Keyword(s): microcontrollers, gsm module, api server, web development Pre-requisite(s): Microcontrollers/Embedded System, Programming, Web Development Objective: To develop a battery-powered tracking module and its monitoring system Milestone 1: Designed a low-power tracking module containing 8051 and GSM module (batterypowered) Milestone 2: Developed software for the tracking module Milestone 3: Developed monitoring software for the tracking system

DIGITAL SYSTEM DESIGN

0

2025/07/02 11:30

SYSTEM DEVELOPMENT

Implementation of 8051-Binary-Compatible Core

Description: This is a design project to implement a working 8051-binary-compatible core. A similar implementation for 8085 microprocessor is available here. It involves writing HDL (Hardware Description Language) codes and simulating it on a simulation software like ModelSim. The final implementation needs to be fully tested and subsequently be improvised (if possible). **NOTE:** An existing implementation is already available on the internet. Evaluation for this project will be based on progress - you need to show that you implement this on your own.

Keyword(s): 8051, FPGA, reconfigurable computing, microcontroller softcore

Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture

Objective: To implement 8-bit microcontroller core (8051 clone) on FPGA

Milestone 1: Completed Instruction Decoding for ALL 8051 instructions

Milestone 2: Completed State Machine for 8051 Instruction Fetch and Execution

Milestone 3: Completed Testbench for 8051-Binary-Compatible Core

Description: This project is mainly software development, with real hardware implementation (Raspberry Pi platform). The main target is to implement vision-based vehicle registration dentification system on real hardware. Implementation MUST BE written based on mylingpro library [i.e. libraries like OpenCV cannot be used). Warning: This project requires purchases of components/modules that may not be reimbursed by the department. (eyword(s): vision system, image processing Pre-requisite: Computer Programming, Image Processing Dijective: To develop a Vehicle Registration Identification System Wilestone 1: Implemented algorithm for vehicle registration plate detection Wilestone 2: Implemented algorithm for character recognition (identification) Wilestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development microcontroller) work. It involves producing a working mobile robot platform (maybe something like his? or this?). Any open designs available online can be used (usually done using free cad tools like reecAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. <i>Narming: This project requires purchases of components/modules that may not be reimbursed by he department.</i> (eyword(s): microcontrollers, mobile robots, autonomous navigation *re-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Disective: To develop a mobile robot platform chassis+motor+servo+controller) 4) elestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) 4) elestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle wordapce)	1. Development of a Vision-based Vehicle Registration Identification System
Acceyword(s): vision system, image processing Pre-requisite: Computer Programming, Image Processing Disjective: To develop a Vehicle Registration Identification System Wilestone 1: Implemented algorithm for vehicle registration plate detection Wilestone 2: Implemented algorithm for character recognition (identification) Wilestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development microcontroller) work. It involves producing a working mobile robot platform (maybe something like his? or this?). Any open designs available online can be used (usually done using free cad tools like reeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. <i>Warning: This project requires purchases of components/modules that may not be reimbursed by the department</i> . Yee-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Dispective: To develop a mobile robot platform with basic navigation features Wilestone 1: Assembled an easily-reproducible mobile robot platform chassis+motor+servo+controller) Wilestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Wilestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle wordance)	 Description: This project is mainly software development, with real hardware implementation (Raspberry Pi platform). The main target is to implement vision-based vehicle registration identification system on real hardware. Implementation MUST BE written based on my1imgpro library (i.e. libraries like OpenCV cannot be used). Warning: This project requires purchases of components/modules that may not be reimbursed by the department.
Description: This project is mainly hardware development - with some software development of this? or this?). Any open designs available online can be used (usually done using free cad tools like receCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i> <i>Name</i>	Keyword(s): vision system, image processing
Dijective: To develop a Vehicle Registration Identification System Milestone 1: Implemented algorithm for vehicle registration plate detection Milestone 2: Implemented algorithm for character recognition (identification) Milestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like reeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Marning: This project requires purchases of components/modules that may not be reimbursed by the department. Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Dijective: To develop a mobile robot platform with basic navigation features Wilestone 1: Assembled an easily-reproducible mobile robot platform chasis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle wordance)	Pre-requisite: Computer Programming, Image Processing
Milestone 1: Implemented algorithm for vehicle registration plate detection Milestone 2: Implemented algorithm for character recognition (identification) Milestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Marning: This project requires purchases of components/modules that may not be reimbursed by the department. Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Disjective: To develop a mobile robot platform with basic navigation features Wilestone 1: Assembled an easily-reproducible mobile robot platform chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Objective: To develop a Vehicle Registration Identification System
Vilestone 2: Implemented algorithm for character recognition (identification) Vilestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform • Description: This project is mainly hardware development - with some software development microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. • Keyword(s): microcontrollers, mobile robots, autonomous navigation • • Cererequisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System • • • • • • • • • • • • •	Milestone 1: Implemented algorithm for vehicle registration plate detection
Milestone 3: Implemented system on real hardware (Raspberry Pi platform) 2. Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development microcontroller) work. It involves producing a working mobile robot platform (maybe something like his? or this?). Any open designs available online can be used (usually done using free cad tools like reeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. <i>Warning:</i> This project requires purchases of components/modules that may not be reimbursed by the department. Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Dijective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Milestone 2: Implemented algorithm for character recognition (identification)
Development of an Autonomous Mobile Robot Platform Description: This project is mainly hardware development - with some software development microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. Cerecquisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Dejective: To develop a mobile robot platform with basic navigation features Wilestone 1: Assembled an easily-reproducible mobile robot platform chassis+motor+servo+controller) Wilestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Wilestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle woridance)	Milestone 3: Implemented system on real hardware (Raspberry Pi platform)
Description: This project is mainly hardware development - with some software development microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department. * Keyword(s): microcontrollers, mobile robots, autonomous navigation * Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System * Objective: To develop a mobile robot platform with basic navigation features * Milestone 1: Assembled an easily-reproducible mobile robot platform chassis+motor+servo+controller) * Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) * Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle wordance)	Development of an Autonomous Mobile Robot Platform
Keyword(s): microcontrollers, mobile robots, autonomous navigation Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle	Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. Warning: This project requires purchases of components/modules that may not be reimbursed by the department.
Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Keyword(s): microcontrollers, mobile robots, autonomous navigation
Dbjective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)	Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System
Milestone 1: Assembled an easily-reproducible mobile robot platform chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle	Objective: To develop a mobile robot platform with basic navigation features
Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle	Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller)
Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle	Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn)
woldance)	Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)
SOFTWARE DEVELOPMENT	SOFTWARE DEVELOPMENT

Azman @UniMAP - http://azman.unimap.edu.my/dokuwiki/

1.
Development of an ARM Emulator (Simple Raspberry Pi Simulator)
0
Description: This project is purely software development. The main target is to develop a simple
Raspberry Pi Simulator with basic GPIO control functionalities. This, however, requires an ARM emulator that can at least execute basic instructions like data transfer (register/memory), arithmetic
and branching.
0
Keyword(s): arm emulator, raspberry pi simulator
0

Pre-requisite: Computer Programming, Computer Architecture

11/25

Objective: To develop an ARM emulator that can be used to simulate Raspberry Pi SBC

Milestone 1: Completed ARM Instruction Decoder (preferably with working assembler/compiler)

Milestone 2: Completed ARM System with Memory

Milestone 3: Developed a simple Raspberry Pi Simulator

Project Titles 2020

1.
Smart Farm Irrigation System Monitoring and Control
 Description: This is a hands-on project that will actually be used at UniMAP's Institute of Sustainable Agro-Technology (INSAT). Initial work involves developing a system that needs to control irrigation of a small plot, and monitor temperature and possibly water usage. All data will be sent to a centralized data center for the whole farm. <i>Warning:</i> This project requires purchases of components/modules that may not be reimbursed by the department.
<pre>Keyword(s): microcontroller, embedded system, data server </pre>
Pre-requisite(s): Microcontrollers/Embedded System Development
Objective: To develop an irrigation system monitoring and control platform
Milestone 1: Simple valve control system (timer & manual override) with power consumption analysis
Milestone 2: to be decided
Milestone 3: <i>to be decided</i>
Development of a Quadcopter Drone with Autonomous Flying Capability
Description: This project is revolves around the idea of replicating an open source quadcopter/drone design (here & here), while introducing autonomous flying mechanism(s). Warning: This project requires purchases of components/modules that may not be reimbursed by the department.
Keyword(s): drone, quadcopters, uav
Pre-requisite(s): Microcontrollers/Embedded System Development
Objective: To develop a working quadcopter that is capable of autonomous flying
Milestone 1: Assembled a quadcopter platform
Milestone 2: Developed/Modified software for autonomous flying
Milestone 3: Tested autonomous flying feature
DIGITAL SYSTEM DESIGN

0

SYSTEM DEVELOPMENT

Implementation of 8051-Binary-Compatible Core

Description: This is a design project to implement a working 8051-binary-compatible core. It involves writing HDL (Hardware Description Language) codes and simulating it on a simulation software like ModelSim. The final implementation needs to be fully tested and subsequently be improvised (if possible). **Warning:** An existing implementation is already available on the internet. Evaluation for this project will be based on progress - you need to show that you implement this on your own.

Keyword(s): 8051, FPGA, reconfigurable computing, microcontroller softcore

Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture

Objective: To implement 8-bit microcontroller core (8051 clone) on FPGA

Milestone 1: Completed Instruction Decoding for ALL 8051 instructions

Milestone 2: Completed State Machine for 8051 Instruction Fetch and Execution

Milestone 3: Completed Testbench for 8051-Binary-Compatible Core

SOFTWARE DEVELOPMENT

SYSTEM DEVELOPMENT 1. Mapping and Localization for Mobile Robot Platform Using Robot Simulator Description: This project is purely software development but with embedded systems application. A robot simulation software like Player/Stage is needed. The development revolves around creating an algorithm for a mobile robot platform so that it can reliably map its surrounding and at the same time localize itself within that environment (something like this). 0 Keyword(s): mapping, localization, simultaneous-LAM (SLAM), mobile robot, robot simulation software Pre-requisite: Computer Programming, Maths Objective: To develop a practical mapping and localization algorithm/application Milestone 1: Developed Usable Mobile Robot Platform Model on an Existing Simulator Milestone 1: Integrated Basic Mapping Algorithm Milestone 2: Integrated Localization Algorithm 2. **CAD Tool Development: Logic Simulator** Description: This project is purely software development but with applications in digital electronics. It involves creating a simple netlist format for digital circuits and developing a parser for the format. The software need to be able to create internal data structure for the logic circuit and execute logic/timing simulation. A simple waveform viewer is also needed, but any available open-source tool can be used for this. ٥ Keyword(s): CAD, circuit simulator, logic simulator Pre-requisite: Computer Programming, Maths, Digital Logic Objective: To develop a circuit (@logic) simulator Milestone 1: Developed a parser for custom netlist and a data structure for logic circuit Milestone 2: Developed timing/logic simulation tool Milestone 3: Completed verification of timing/logic simulation tool Project Titles 2019

1. **Development of an Autonomous Mobile Robot Platform** Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. **Warning:** This project requires purchases of components/modules that may not be reimbursed by the department. Keyword(s): microcontrollers, mobile robots, autonomous navigation Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System Objective: To develop a mobile robot platform with basic navigation features Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller) Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn) Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance) 2. Development of a Battery-powered Tracking Module with Monitoring System Description: This project is a combination of hardware/software development. It requires the student to produce a low-power tracking module using microcontroller (both hardware and software development involved). The Monitoring System software can be modified from an existing system provided. **Warning:** This project requires purchases of components/modules that may not be reimbursed by the department. Keyword(s): microcontrollers, gsm module, api server, web development Pre-requisite(s): Microcontrollers/Embedded System, Software Engineering, Web Development Objective: To develop a battery-powered tracking module and its monitoring system Milestone 1: Designed a low-power tracking module containing 8051 and GSM module (batterypowered) Milestone 2: Developed software for the tracking module Milestone 3: Developed monitoring software for the tracking system Project Titles 2018

Azman @UniMAP - http://azman.unimap.edu.my/dokuwiki/

2.

SYSTEM DEVELOPMENT

Development of an Autonomous Mobile Robot Platform

Description: This project is mainly hardware development - with some software development (microcontroller) work. It involves producing a working mobile robot platform (maybe something like this? or this?). Any open designs available online can be used (usually done using free cad tools like FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (motor, servo, sensor, etc.). This project also need a basic autonomous navigation software to be developed. **Warning:** This project requires purchases of components/modules that may not be reimbursed by the department.

Keyword(s): microcontrollers, mobile robots, autonomous navigation

Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System

Objective: To develop a mobile robot platform with basic navigation features

Milestone 1: Assembled a mobile robot platform (chassis+motor+servo+controller)

Milestone 2: Developed software for basic autonomous driving (e.g. drive straight, turn)

Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. obstacle avoidance)

Development of a Raspberry-Pi-based Phone

Description: This project is a combination of hardware/software development. It requires the student to produce a working phone based on Raspberry Pi, along with a GSM module and a touch-screen LCD. Software development involves developing bare-metal codes (no Linux or any existing OS can be used). **Warning:** This project requires purchases of components/modules that may not be reimbursed by the department.

Keyword(s): raspberry pi, bare-metal, smartphone, touch screen lcd

Pre-requisite(s): Microcontrollers/Embedded System, Software Engineering

Objective: To develop basic touch screen phone based on Raspberry Pi

Milestone 1: Completed Interfacing GSM Modem to Raspberry Pi (i.e. make calls, etc.)

Milestone 2: Completed Interfacing Touch Screen LCD to Raspberry Pi (i.e. input, display)

Milestone 3: Completed A Working Phone (including basic OS) based on Raspberry Pi

DIGITAL SYSTEM DESIGN

0

SYSTEM DEVELOPMENT

Implementation of 8051-Binary-Compatible Core

Description: This is a design project to implement a working 8051-binary-compatible core. It involves writing HDL (Hardware Description Language) codes and simulating it on a simulation software like ModelSim. The final implementation needs to be fully tested and subsequently be improvised (if possible). **Warning:** An existing implementation is already available on the internet. Evaluation for this project will be based on progress - you need to show that you implement this on your own.

Keyword(s): 8051, FPGA, reconfigurable computing, microcontroller softcore

Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture

Objective: To implement 8-bit microcontroller core (8051 clone) on FPGA

Milestone 1: Completed Instruction Decoding for ALL 8051 instructions

Milestone 2: Completed State Machine for 8051 Instruction Fetch and Execution

Milestone 3: Completed Testbench for 8051-Binary-Compatible Core

SOFTWARE DEVELOPMENT

2.

SYSTEM DEVELOPMENT

Mapping and Localization for Mobile Robot Platform Using Player/Stage

Description: This project is purely software development but with embedded systems application. A robot simulation software like Player/Stage is needed and will be used. The development revolves around creating an algorithm for a mobile robot platform so that it can reliably map its surrounding and at the same time localize itself within that environment (something like this).

Keyword(s): mapping, localization, simultaneous-LAM (SLAM), mobile robot, player/stage software

Pre-requisite: Computer Programming, Maths

Objective: To develop a practical mapping and localization algorithm/application

Milestone 1: Developed Usable Mobile Robot Platform Model on Stage

Milestone 1: Integrated Basic Mapping Algorithm

Milestone 2: Integrated Localization Algorithm

CAD Tool Development: Logic Simulator

Description: This project is purely software development but with applications in digital electronics. It involves creating a simple netlist format for digital circuits and developing a parser for the format. The software need to be able to create internal data structure for the logic circuit and execute logic/timing simulation. A simple waveform viewer is also needed, but any available open-source tool can be used for this.

Keyword(s): CAD, circuit simulator, logic simulator

Pre-requisite: Computer Programming, Maths, Digital Logic

Objective: To develop a circuit (@logic) simulator

Milestone 1: Developed a parser for custom netlist and a data structure for logic circuit

Milestone 2: Developed timing/logic simulation tool

Milestone 3: Completed verification of timing/logic simulation tool

SYSTEM DEVELOPMENT
1. Development of a Mobile Robot Platform
 This project is mainly hardware development - with some coding on 8051 controller.
 Keyword(s): microcontrollers. mobile robots. 8051 core
Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System
Objective: To develop a mobile robot platform with basic navigation features
Scope:
produce a working mobile robot platform (maybe something like this? or this)
may use open designs available online
use free cad tools like FreeCAD or OpenSCAD
include/enable basic navigation interface (motor, servo, sensor, etc.)
HARDWARE/BOARD DEVELOPMENT
1. Extendable FPGA Development Board for Reconfigurable Computing Research Platform
° Description: This project is purely hardware development.
« Keyword(s): FPGA, reconfigurable computing, development board
Pre-requisite: Digital Electronics, Microprocessor System
Objective: To develop an extendable FPGA development board to be used as platform for reconfigurable computing research/applications
Scope:
produce a working prototype for FPGA development board
design a working interface for future extensions
■ include/enable reconfigurable computing features in the design?

DIGITAL SYSTEM DESIGN

1. Implementation of OpenRisc Core on FPGA
Description: This is a design project using VHDL
Keyword(s): OpenRISC, FPGA, reconfigurable computing, microprocessor softcore
Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture
Objective: To implement custom OpenRISC core on FPGA
Scope:
implement a working core
testing and improvise (if possible)
Implementation of 8051-Binary-Compatible Core on FPGA TAKEN
Description: This is a design project using VHDL
Keyword(s): 8051, FPGA, reconfigurable computing, microcontroller softcore
Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture
Objective: To implement 8-bit microcontroller core (8051 clone) on FPGA
Scope:
implement a working core
testing and improvise (if possible)
WARNING An existing implementation is already available on the internet. Evaluation for this project will be based on progress - you need to show that you implement this on your own.
Application of Random Number Generator (RNG) on FPGA (Simple Game Implementation?)
Description: This is a design/analytical project based on the RNG proposed on this page.
Keyword(s): RNG, random number generator, FPGA, reconfigurable computing
Pre-requisite: Digital Electronics, Computer Architecture
Objective: To study the effectiveness of hardware RNG on FPGA
Secondary Objective: To implement an application that utilize hardware RNG
Scope:
implementation, testing, and improvise (if possible) the proposed hardware RNG
testing is essential - maybe design an alternative test-suite to the one used 4.
Implementation of 16-bit Floating Point Arithmetic Unit on FPGA
Description: This is a design project using VHDL
Keyword(s): floating-point arithmetic unit, FPGA, reconfigurable computing
Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture
Objective: To implement a custom 16-bit floating-point arithmetic unit on FPGA °
Scope:
implement a working floating-point unit
testing and improvise (if possible) SOFTWARE DEVELOPMENT

1. Mapping and Localization for Mobile Robot Platform Using Player/Stage	
• Description: This project is purely software development but with embedded systems application.	
° Keyword(s): mapping, localization, simultaneous-LAM (@ SLAM), mobile robot, player/stage software	
° Pre-requisite: Computer Programming, Maths	
° Objective: To develop a practical mapping and localization algorithm/application for mobile robot platform	
Scope:	
lusing this	
something like this	
test on simulator platform only	
2. Implementation of Behavior-based Mobile Robot Platform TAKEN	
° Description: This project is purely software development.	
ہ Keyword(s): behavior-based robot, evolutionary robotics	
° Pre-requisite: Computer Programming, Artificial Intelligence	
。 Objective: To implement a behavior-based mobile robot system	
° Scope:	
implement/analyze an evolutionary algorithm (like this)	
implement/modify a mobile robot platform (maybe based on this)	
explore/use Stage mobile robot simulator	
simulate the system to train/evolve into a reliable system for a chosen application	
° Note:	
sample implementation using EyeSim mobile robot simulator will be provided	
3. Development of Road Map Database for Web Applications	
° Description: This project is purely software development.	
« Keyword(s): mapping, road maps	
° Pre-requisite: Computer Programming, Database/Web Programming	
o Objective: To develop a Road Map Database for Web application	
° Scope:	
must build a proper database systems capable of storing road map data	
data may be obtained from OSM?	
must be able to serve road map data upon request	
must implement a client-side sample application	
4. Development of Data Processing Software for Vehicle Monitoring System	
Description: This project is purely software development.	
Keyword(s): data mining, data analysis	
Pre-requisite: Computer Programming, Database/Web Programming	
Objective: To develop a data processing software for Vehicle Monitoring System	
Scope:	
based on available data gathered by CEASTech's Vehicle Monitoring System	
need to analyze useful information that can be generated	
need to implement algorithm(s) to produce that information	
must implement a client-side sample application	
Development of University Course/Student Data Management System	
Description: This project is purely software development.	
Keyword(s): university course/student data management, data analysis	
Pre-requisite: Computer Programming, Database/Web Programming	
Objective: To develop a web-based software for University Course/Student Data Management	
Scope:	
basically continuing (finishing up) this project	
need to enable multiple admin, multiple lecturer per course	
need to enable student to view current coursework marks	

SYSTEM DEVELOPMENT
1. Development of a Mobile Robot Platform
o Description: This project is mainly hardware development - with some coding on 8051 controller.
Keyword(s): microcontrollers, mobile robots, 8051 core
Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System
Objective: To develop a mobile robot platform with basic navigation features
Scope:
produce a working mobile robot platform (may use open designs available online)
include/enable basic navigation interface (motor, servo, sensor, etc.)
Development of a Protoype Mobile Phone TAKEN
Description: This project is an all around systems development (i.e. hardware interfacing, programming).
Keyword(s): Raspberry Pi, GSM, mobile phone
Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System
Objective: To develop a simple mobile phone with touch screen interface
Scope:
revolves around Raspberry Pi, a GSM module and an LCD with touch screen
working phone is the main priority
may include work on build custom android for benchmarking
HARDWARE/BOARD DEVELOPMENT
Extendable FPGA Development Board for Reconfigurable Computing Research Platform
Description: This project is purely hardware development.
Keyword(s): FPGA, reconfigurable computing, development board
Pre-requisite: Digital Electronics, Microprocessor System
Objective: To develop an extendable FPGA development board to be used as platform for reconfigurable computing research/applications
Scope:
produce a working prototype for FPGA development board
design a working interface for future extensions
include/enable reconfigurable computing features in the design?
DIGITAL SYSTEM DESIGN

1. Implementation of OpenRisc Core on FPGA	
° Description: This is a design project using VHDL	
° Keyword(s): OpenRISC, FPGA, reconfigurable computing, microprocessor softcore	
° Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture	
° Objective: To implement custom OpenRISC core on FPGA	
° Scope:	
implement a working core	
testing and improvise (if possible)	
2. Implementation of 8085-Binary-Compatible Core on FPGA TAKEN	
° Description: This is a design project using VHDL	
Keyword(s): 8085, FPGA, reconfigurable computing, microprocessor softcore	
° Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture	
Objective: To implement 8-bit microprocessor core (8085 clone) on FPGA	
Scope:	
implement a working core	
testing and improvise (if possible)	
Implementation of 8051-Binary-Compatible Core on FPGA	
Description: This is a design project using VHDL	
Keyword(s): 8051, FPGA, reconfigurable computing, microcontroller softcore	
Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture	
Objective: To implement 8-bit microcontroller core (8051 clone) on FPGA	
Scope:	
implement a working core	
testing and improvise (if possible)	
WARNING An existing implementation is already available on the internet. Evaluation for this project will be based on progress - you need to show the you implement this on your own.	at
Application of Random Number Generator (RNG) on FPGA (Simple Game Implementation?)	
Description: This is a design/analytical project based on the RNG proposed on this page.	
Keyword(s): RNG, random number generator, FPGA, reconfigurable computing	
Pre-requisite: Digital Electronics, Computer Architecture	
Objective: To study the effectiveness of hardware RNG on FPGA	
Secondary Objective: To implement an application that utilize hardware RNG	
Scope:	
implementation, testing, and improvise (if possible) the proposed hardware RNG	
testing is essential - maybe design an alternative test-suite to the one used	
Implementation of 16-bit Floating Point Arithmetic Unit Core on FPGA	
Description: This is a design project using VHDL	
Keyword(s): floating-point arithmetic unit, FPGA, reconfigurable computing	
Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture	
Objective: To implement a custom 16-bit floating-point arithmetic unit on FPGA	
Scope:	
implement a working floating-point unit	
testing and improvise (if possible)	

SYSTEM DEVELOPMENT
1. Mouning and Legalization for Mobile Debet Distform Using Disvor/Stage
°
o Normandel papering localization, simultaneous LAM (OSLAM), mabile rabet, player/stage software
o Pro requisito: Computer Programming, Maths
Pre-requisite: Computer Programming, Maths o Objective: To develop a practical mapping and leadlighting algorithm (application for mabile rebat platform)
Objective: To develop a practical mapping and localization algorithm/application for mobile robot platform
Scope:
test on simulator platform only 2. CAD Tool Development: Circuit Simulator TAKEN
O
os Norward(c), CAD, circuit cimulator, logic cimulator
v v Regword(s): CAD, circuit simulator, logic simulator Notes acquisites Computer Discrete Programming. Mathe, Complementator Devises, Disited Legis
Pre-requisite: Computer Programming, Maths, Semiconductor Devices, Digital Logic
Objective: To develop a circuit (@logic) simulator
Secondary Objective: develop a waveform viewer as well
Scope:
use open source parser or write own (can be a project on its own?)
must be capable of timing simulation (timing model)
alternatively: write a VHDL version of the Icarus Verilog? ■
another branch: start from spice3f5 - get it to compile on linux & improvise 3.
CAD Tool Development: Automatic Place & Route °
 Description: This project is purely software development but with applications in microelectronics.
Keyword(s): CAD, automatic place and route, APR
Pre-requisite: Computer Programming, Maths, Semiconductor/PCB Layout 。
Objective: To develop an automatic place and route (APR) tool 。
Scope:
use open source parser or write own (can be a project on its own?)
can be board-level or ic-level (select input netlist type and output format)
Development of Memristor Device Model for Spice Simulation
Description: This project is purely software development but requires good background in low-level electronics (semiconductor physics).
Keyword(s): memristor, device model, spice
Pre-requisite: Computer Programming, Device Physics °
Objective: To develop a spice simulation model for a memristor device °
Scope:
obtain open-source spice simulator code
learn how a model is created in spice
learn characteristics of a memristor
write a device model for memristor
find a way to validate proposed memristor model
(if possible) fabricate a memristor, build a simple test circuit and verify simulation results?

From: http://azman.unimap.edu.my/dokuwiki/ - Azman @UniMAP

Permanent link: http://azman.unimap.edu.my/dokuwiki/doku.php?id=archive:pgt444&rev=1741315358



Last update: 2025/03/07 10:42