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.

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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)

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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

1.	
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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 develo (microcontroller) work. It involves producing a working mobile robot platform (maybe s this? or this?). Any open designs available online can be used (usually done using free FreeCAD or OpenSCAD), but the platform needs to have basic navigation interface (mo sensor, etc.). This project also need a basic autonomous navigation software to be dev Warning: This project requires purchases of components/modules that may not be related the department.	something like cad tools like otor, servo, reloped.
Keyword(s): microcontrollers, mobile robots, autonomous navigation	
Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedde	d 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, turr	ו)
Milestone 3: Completed autonomous mobile robot platform with basic navigation (e.g. avoidance)	obstacle

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

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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

1.	
Development of a Vision-based Vehicle Registration Identification	on System
Description: This project is mainly software development, with real hard (Raspberry Pi platform). The main target is to implement vision-based veri identification system on real hardware. Implementation MUST BE written (i.e. libraries like OpenCV cannot be used). Warning: This project require components/modules that may not be reimbursed by the department.	ehicle registration n based on my1imgpro library
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 detect	ion
Milestone 2: Implemented algorithm for character recognition (identifica	ation)
Milestone 3: Implemented system on real hardware (Raspberry Pi platfo	rm)
2. Development of an Autonomous Mobile Robot Platform	
Description: This project is mainly hardware development - with some so (microcontroller) work. It involves producing a working mobile robot plat this? or this?). Any open designs available online can be used (usually de FreeCAD or OpenSCAD), but the platform needs to have basic navigation sensor, etc.). This project also need a basic autonomous navigation soft Warning: This project requires purchases of components/modules that the department.	tform (maybe something like one using free cad tools like n interface (motor, servo, ware to be developed.
Keyword(s): microcontrollers, mobile robots, autonomous navigation	
Pre-requisite(s): Digital Electronics, Microprocessor System, Microcontro	llers/Embedded System
Objective: To develop a mobile robot platform with basic navigation feat	tures
Milestone 1: Assembled an easily-reproducible mobile robot platform (chassis+motor+servo+controller)	
Milestone 2: Developed software for basic autonomous driving (e.g. driv	e straight, turn)
Milestone 3: Completed autonomous mobile robot platform with basic na avoidance)	avigation (e.g. obstacle
SOFTWARE DEVELOPMENT	

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

1.

SYSTEM DEVELOPMENT

Development of an ARM Emulator (Simple Raspberry Pi Simulator) ° 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. ° Keyword(s): arm emulator, raspberry pi simulator ° Pre-requisite: Computer Programming, Computer Architecture ° 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

۱. 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. Warning: 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
Dbjective: 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> 2.
o 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.
<pre><eyword(s): <="" drone,="" pre="" quadcopters,="" uav=""></eyword(s):></pre>
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

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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

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2.

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SYSTEM DEVELOPMENT

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).

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

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

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

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

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SYSTEM DEVELOPMENT

1. 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	
• 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 (maybe something like this? or this)	
• may use open designs available online	
• use free cad tools like FreeCAD or OpenSCAD	
nclude/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

<pre>scription: This is a design project using VHPL provides: OpenRUSC, FPGA, reconfigurable computing, microprocessor softcore requisite: Digital Electronics, Microprocessor System, Computer Architecture requisite: Digital Electronics, Microprocessor System, Computer Architecture elective: To implement custom OpenRISC core on FPGA permenta working core scription: This is a design project using VHPL provides (If possible) permentation of SOS1-Electronics, Microprocessor System, Computer Architecture requisite: Digital Electronics, Microprocessor System, Computer Architecture perture: To implement B-bit microcontroller core (8051 clone) on FPGA provides (BOS1, FPGA, reconfigurable computing, microcontroller softcore requisite: Digital Electronics, Microprocessor System, Computer Architecture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement B-bit microcontroller core (8051 clone) on FPGA perture perture: To implement an application that utilize hardware RNG perture: To implement an application that utilize hardware RNG perture: To implement an application that utilize hardware RNG perute: To implement an application tha</pre>	SYSTEM DEVELOPMENT
words1: Open NSC, FRGA, reconfigurable computing, microprocessor softcore exquisite: Digital Electronics, Microprocessor System, Computer Architecture iper two softs core is working core is minimum a working core is minimum a disprovise (if possible) per the destination of 2051 Elinsry-Compatible Core on FPGA TAKEN configurable computing, microcontroller softcore exquisite: Digital Electronics, Microprocessor System, Computer Architecture is requisite: Digital Electronics, Microprocessor System, Computer Architecture is encoded and minorouse (if possible) ARTING An existing implementation is already available on the internet. Evaluation for this project will be based on progrees - you need to show that you implement this on your is requisite: Digital Electronics, Computer Architecture is encoded on the RNG proposed on this page. 'word(s): RNG, random number generator, FPGA, reconfigurable computing exquisite: Digital Electronics, Computer Architecture is equisite: Digital Electronics, Microprocessor System, Computer Architecture is equisite: Digital Electronics, Microprocessor System, Computer RNG ope: is equisite: Digital Electronics, Microprocessor System, Computer Architecture is equisit	1. Implementation of OpenRisc Core on FPGA
<pre>requisite: Digital Electronics, Microprocessor System, Computer Architecture pertive: To implement custom OpenRISC core on FPGA ope: permentation of 8051 Binary Compatible Core on FPGA TAKEN scription: This is a design project using VHDL yuord(s): 8051, FPGA, reconfigurable computing, microcontroller softcore requisite: Digital Electronics, Microprocessor System, Computer Architecture permentation of Rossible) appendit and improvise (if possible) scription: This is a design project using VHDL yuord(s): 8051, FPGA, reconfigurable computing, microcontroller softcore requisite: Digital Electronics, Microprocessor System, Computer Architecture permentation of Rossible) appendit and miprovise (if possible) architecture and provise (if possible) architecture and improvise (if possible) architecture and architec</pre>	。 Description: This is a design project using VHDL
<pre>intervier: To implement custom OpenRISC core on FPGA pre: pre: pre: pre: pre: pre: pre: pre:</pre>	。 Keyword(s): OpenRISC, FPGA, reconfigurable computing, microprocessor softcore
<pre>pre: pre: pre: pre: pre: pre: pre: pre:</pre>	ہ Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture
perment avarking core string and improvise (if possible) permentation of 8051-Binary-Compatible Core on FPGA TAKEN scription: This is a design project using VHDL ward(s): 8051, FPGA, reconfigurable computing, microcontroller softcore requisite: Digital Electronics, Microprocessor System, Computer Architecture requisite: Digital Electronics, Microprocessor System, Computer Architecture perment avarking core string and improvise (if possible) ARMING 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 provide): RNG, random number Generator (NKG) on FPGA (Simple Game Implementation?) scription: This is a design/analytical project based on the RNG proposed on this page. word(s): RNG, random number generator, FPGA, reconfigurable computing equisite: Digital Electronics, Computer Architecture permentation, testing, and improvise (if possible) the proposed hardware RNG ope: permentation, testing, and improvise (if possible) the proposed hardware RNG ope: permentation, testing, and improvise (if possible) the proposed hardware RNG ope: permentation, testing, and improvise (if possible) the proposed hardware RNG ope: permentation, testing, and improvise (if possible) the proposed hardware RNG ope: permentation, testing, and improvise (if possible) the proposed hardware RNG ope: permentation, testing, and improvise (if possible) the proposed hardware RNG ope: permentation, testing, and improvise (if possible) the one used stription: This is a design project using VHDL word(s): Roting point arithmetic unit, PFGA, reconfigurable computing ope: permentation, testing, and improvise (if possible) the proposed hardware RNG ope: permentation, testing, and improvise (if possible) the one used stription: This is a design project using VHDL word(s): Roting point arithmetic unit, PFGA, reconfigurable computing ope: permentation, testing, point arithmetic unit, PFGA, reconfigurable computing ope: permentation, test	。 Objective: To implement custom OpenRISC core on FPGA
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permentation of 8951-Binary-Compatible Core on FPGA TAKEN scription: This is a design project using VHDL yoord(s): 8051, FPGA, reconfigurable computing, microcontroller softcore requisite: Digital Electronics, Microprocessor System, Computer Architecture jective: To implement 8-bit microcontroller core (8051 clone) on FPGA ope: perment a working core sting and improvise (if possible) ARNING 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 perfection of Random Number Generator (RNG) on FPGA (Simple Game Implementation?) scription: This is a design/analytical project based on the NNG proposed on this page. yword(s): RNG, random number generator, FPGA, reconfigurable computing e-requisite: Digital Electronics, Computer Architecture perfective: To study the effectiveness of hardware RNG on PFGA condary Objective: To implement an application that utilize hardware RNG stripting is essential - maybe design an alternative test-suite to the one used thementation, f16-bit Floating Point Arithmetic Unit on FPGA scription: This is a design project using VHDL yoord(s): Roating-point arithmetic Unit on FPGA scription: This is a design project using VHDL yoord(s): Roating-point arithmetic Unit on FPGA scription: This is a design project using VHDL yoord(s): Roating-point arithmetic Unit on FPGA scription: This is a design project using VHDL yoord(s): Roating-point arithmetic Unit on FPGA scription: This is a design project using VHDL yoord(s): Roating-point arithmetic Unit on FPGA scription: This is a design project using VHDL yoord(s): Roating-point arithmetic Unit on FPGA scription: This is a design project using VHDL yoord(s): Roating-point arithmetic Unit on FPGA scription: This is a design project using VHDL yoord(s): Roating-point arithmetic Unit on FPGA scription: This is a design project using YHDL yoord(s): Roating-point arithmetic Unit on FPGA scription: This is a design project Using VHDL yoord(s	implement a working core
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erequisite: Digital Electronics, Microprocessor System, Computer Architecture sective: To implement 8-bit microcontroller core (8051 clone) on FPGA ope: plement a working core sting and improvise (if possible) ARNING 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 m. plication of Random Number Generator (RNG) on FPGA (Simple Game Implementation?) scription: This is a design/analytical project based on the RNG proposed on this page. wword(s): RNG, random number generator, FPGA, reconfigurable computing e-requisite: Digital Electronics, Computer Architecture jective: To study the effectiveness of hardware RNG on FPGA condary Objective: To implement an application that utilize hardware RNG ope: plementation, testing, and improvise (if possible) the proposed hardware RNG ope: plementation of 16-bit Floating Point Arithmetic Unit on FPGA scription: This is a design project using VHDL word(s): floating-point arithmetic unit, PFGA, reconfigurable computing e-requisite: Digital Electronics, Computer Architecture plementation of 16-bit Floating Point Arithmetic Unit on FPGA scription: This is a design project using VHDL word(s): floating-point arithmetic Unit on FPGA scription: This is a design project using VHDL word(s): floating-point arithmetic unit, PFGA, reconfigurable computing e-requisite: Digital Electronics, Microprocessor System, Computer Architecture jective: To implement a custom 16-bit floating-point arithmetic unit on FPGA	° Description: This is a design project using VHDL
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m. billioation of Random Number Generator (RNG) on FPGA (Simple Game Implementation?) escription: This is a design/analytical project based on the RNG proposed on this page. yword(s): RNG, random number generator, FPGA, reconfigurable computing e-requisite: Digital Electronics, Computer Architecture jective: To study the effectiveness of hardware RNG on FPGA condary Objective: To implement an application that utilize hardware RNG ope: plementation, testing, and improvise (if possible) the proposed hardware RNG ope: plementation of 16-bit Floating Point Arithmetic Unit on FPGA escription: This is a design project using VHDL yword(s): floating-point arithmetic unit, FPGA, reconfigurable computing e-requisite: Digital Electronics, Microprocessor System, Computer Architecture iperview: To implement a custom 16-bit floating-point arithmetic unit on FPGA	testing and improvise (if possible)
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e-requisite: Digital Electronics, Computer Architecture ojective: To study the effectiveness of hardware RNG on FPGA condary Objective: To implement an application that utilize hardware RNG ope: plementation, testing, and improvise (if possible) the proposed hardware RNG sting is essential - maybe design an alternative test-suite to the one used uplementation of 16-bit Floating Point Arithmetic Unit on FPGA escription: This is a design project using VHDL syvord(s): floating-point arithmetic unit, FPGA, reconfigurable computing e-requisite: Digital Electronics, Microprocessor System, Computer Architecture ojective: To implement a custom 16-bit floating-point arithmetic unit on FPGA	Description: This is a design/analytical project based on the RNG proposed on this page.
o bjective: To study the effectiveness of hardware RNG on FPGA condary Objective: To implement an application that utilize hardware RNG o be: plementation, testing, and improvise (if possible) the proposed hardware RNG sting is essential - maybe design an alternative test-suite to the one used sting is essential - maybe design an alternative test-suite to the one used scription: This is a design project using VHDL overd(s): floating-point arithmetic unit, FPGA, reconfigurable computing e-requisite: Digital Electronics, Microprocessor System, Computer Architecture objective: To implement a custom 16-bit floating-point arithmetic unit on FPGA	Keyword(s): RNG, random number generator, FPGA, reconfigurable computing
condary Objective: To implement an application that utilize hardware RNG ope: plementation, testing, and improvise (if possible) the proposed hardware RNG sting is essential - maybe design an alternative test-suite to the one used plementation of 16-bit Floating Point Arithmetic Unit on FPGA escription: This is a design project using VHDL word(s): floating-point arithmetic unit, FPGA, reconfigurable computing e-requisite: Digital Electronics, Microprocessor System, Computer Architecture ojective: To implement a custom 16-bit floating-point arithmetic unit on FPGA	Pre-requisite: Digital Electronics, Computer Architecture
ope: plementation, testing, and improvise (if possible) the proposed hardware RNG sting is essential - maybe design an alternative test-suite to the one used plementation of 16-bit Floating Point Arithmetic Unit on FPGA escription: This is a design project using VHDL. yword(s): floating-point arithmetic unit, FPGA, reconfigurable computing e-requisite: Digital Electronics, Microprocessor System, Computer Architecture ojective: To implement a custom 16-bit floating-point arithmetic unit on FPGA	Objective: To study the effectiveness of hardware RNG on FPGA
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sting is essential - maybe design an alternative test-suite to the one used plementation of 16-bit Floating Point Arithmetic Unit on FPGA escription: This is a design project using VHDL yword(s): floating-point arithmetic unit, FPGA, reconfigurable computing e-requisite: Digital Electronics, Microprocessor System, Computer Architecture ojective: To implement a custom 16-bit floating-point arithmetic unit on FPGA	Scope:
appementation of 16-bit Floating Point Arithmetic Unit on FPGA escription: This is a design project using VHDL everequisite: Digital Electronics, Microprocessor System, Computer Architecture ojective: To implement a custom 16-bit floating-point arithmetic unit on FPGA	implementation, testing, and improvise (if possible) the proposed hardware RNG
scription: This is a design project using VHDL yword(s): floating-point arithmetic unit, FPGA, reconfigurable computing e-requisite: Digital Electronics, Microprocessor System, Computer Architecture ojective: To implement a custom 16-bit floating-point arithmetic unit on FPGA	testing is essential - maybe design an alternative test-suite to the one used 4
o yword(s): floating-point arithmetic unit, FPGA, reconfigurable computing e-requisite: Digital Electronics, Microprocessor System, Computer Architecture ojective: To implement a custom 16-bit floating-point arithmetic unit on FPGA	Implementation of 16-bit Floating Point Arithmetic Unit on FPGA
e-requisite: Digital Electronics, Microprocessor System, Computer Architecture ojective: To implement a custom 16-bit floating-point arithmetic unit on FPGA	Description: This is a design project using VHDL
o jective: To implement a custom 16-bit floating-point arithmetic unit on FPGA o	Keyword(s): floating-point arithmetic unit, FPGA, reconfigurable computing
o	Pre-requisite: Digital Electronics, Microprocessor System, Computer Architecture
ope:	Objective: To implement a custom 16-bit floating-point arithmetic unit on FPGA
	Scope:
plement a working floating-point unit	implement a working floating-point unit
sting and improvise (if possible) SOFTWARE DEVELOPMENT	testing and improvise (if possible)

SYSTEM 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:	
using this	
something like this	
test on simulator platform only	
2. Implementation of Behavior-based Mobile Robot Platform TAKEN	
bescription: This project is purely software development.	
« 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	
0	
Description: This project is purely software development.	
Keyword(s): mapping, road maps	
Pre-requisite: Computer Programming, Database/Web Programming	
Objective: To develop a Road Map Database for Web application	
Scope: must build a proper database systems capable of storing road map data	
a 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	
0	
Description: This project is purely software development. ° Keyword(s): data mining, data analysis	
0	
Pre-requisite: Computer Programming, Database/Web Programming	
Objective: To develop a data processing software for Vehicle Monitoring System	
Scope: and 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 5. Development of University Course (Student Date Monorement System	
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
evelopment of a Mobile Robot Platform
$^{\circ}$ escription: This project is mainly hardware development - with some coding on 8051 controller.
。 yword(s): microcontrollers, mobile robots, 8051 core
$^{\circ}$ e-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System
$^{\circ}$ ojective: To develop a mobile robot platform with basic navigation features
° ope:
e oduce a working mobile robot platform (may use open designs available online)
e clude/enable basic navigation interface (motor, servo, sensor, etc.)
evelopment of a Protoype Mobile Phone TAKEN
$^{\circ}$ escription: This project is an all around systems development (i.e. hardware interfacing, programming).
。 yword(s): Raspberry Pi, GSM, mobile phone
。 e-requisite(s): Digital Electronics, Microprocessor System, Microcontrollers/Embedded System
$^{\circ}$ ojective: To develop a simple mobile phone with touch screen interface
° ope:
evolves around Raspberry Pi, a GSM module and an LCD with touch screen
erking phone is the main priority
ay include work on build custom android for benchmarking
HARDWARE/BOARD DEVELOPMENT
tendable FPGA Development Board for Reconfigurable Computing Research Platform
escription: This project is purely hardware development.
wword(s): FPGA, reconfigurable computing, development board
e-requisite: Digital Electronics, Microprocessor System
$^\circ$ ojective: To develop an extendable FPGA development board to be used as platform for reconfigurable computing research/applications
° ope:
educe a working prototype for FPGA development board
sign a working interface for future extensions
Iude/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	
e testing and improvise (if possible)	
2. Implementation of 8085-Binary-Compatible Core on FPGA TAKEN	
o 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)	
3. 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 nee you implement this on your own. 4.	ed to show that
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 5.	
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)	

pping and Localization for Mobile Robot Platform Using Player/Stage cription: This project is purely software development but with embedded systems application. word(s): mapping, localization, simultaneous-LAM (\$5LAM), mobile robot, player/stage software requisite: Computer Programming, Matis cription: This project is appendy and localization algorithmyapplication for mobile robot platform pe: g this mething like this ten simulator platform only To Too Dovelopment: Circuit Simulator TAKEN propriate: To develop a struction simulator TAKEN propriate: To four Software development but with applications in microelectronics. wwrd(s): CA, circuit simulator, fougic simulator requisite: Computer Programming, Maths, Semiconductor Devices, Digital Lagic extive: To develop a circuit (@logic) simulator andary Objective: develop a waveform viewer as well pe:	SYSTEM DEVELOPMENT SOFTWARE DEVELOPMENT
cription: This project is purely software development but with embedded systems application. word(s): mapping, localization, simultaneous LAM (#SLAM), mobile robot, player/stage software requisite: Computer Programming, Maths ective: To develop a practical mapping and localization algorithm/application for mobile robot platform ge: applies	L.
word(s): mapping, localization, simultaneous-LAM (@SLAM), mobile robot, player/stage software requisite: Computer Programming, Maths ective: To develop a practical mapping and localization algorithm/application for mobile robot platform get ig this ig this in minuter platform only Developments-Circuit Simulator TAKEN corption: This project is purely software development but with applications in microelectronics. word(s): CAD, circuit simulator, logic simulator requisite: Computer Programming, Maths, Semiconductor Devices, Digital Logic evelop a circuit (@ilogic) simulator requisite: Computer Programming, Maths, Semiconductor Devices, Digital Logic evelop a circuit (@ilogic) simulator ordary Objective: develop a waveform viewer as well pe: ordary Objective: with evelop a waveform viewer as well pe: ordary objective: advelop a material of the learus Verifing? ther branch: start from spice315 - get it to compile on its win?) st be capable of timing simulation (uning model) erapisite: Computer Programming, Maths, Semiconductor/PCB Layout ective: To develop an automatic place and route (APR) tool pe: open source parser or write own (can be a project on its own?) <	o
requisite: Computer Programming, Maths ective: To develop a practical mapping and localization algorithm/application for mobile robot platform pre: pre: pre: pre: pre: pre: pre: pre:	
ective: To develop a practical mapping and localization algorithm/application for mobile robot platform per applie appli	o
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a way to validate proposed memristor model	ind a way to validate proposed memristor model
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