Sultan Qaboos University
College of Engineering
Department of Electrical & Computer Engineering

Final Year Projects Committee

GUIDELINES TO SENIOR PROJECTS AND PROPOSALS FOR ACADEMIC YEAR 2004-2005

May, 2004

CONTENTS

INTRODUCTION

Senior projects (also called final year projects) are, like any other mandatory courses, part of the degree plan of the Department of Electrical & Computer Engineering. The senior project is divided into two parts: Part I is assigned the code ECCE5009 and is equivalent to 2 credits. Part II is assigned the code ECCE5099 and is equivalent to 3 credits. Students are required to register in Part one first. After successful completion of part I, they can register in Part II.

Senior projects are very important because students learn to work in teams to solve a reasonable size of design/simulation/experimental/implementation problem(s). They give the students the chance to apply and practice the knowledge they have acquired during their studies at SQU. Therefore, a special care and attention is given to the projects. Students are required to work hard from the start in order to get maximum benefit from the project and to achieve good performance.

The evaluation and grade assessment of Senior Projects is done based on Quality and Quantity of work done, Report and Oral Presentations, Webpage design and the Supervisor assessment of the students performing during the project. In Project Part-II beside the above assessment methods/procedures the students are also required to make a Poster of their Project. The Posters are evaluated by invited engineers from industry. The department also gives away two awards for each stream: one for the best project and another for the best poster.

To support students to perform well in their projects, the Department also holds several seminars related to economics, management and realization of projects and preparation of written, visual and Internet presentations of the student works. Attendance to seminars is obligatory.

In this document the students will find general guidelines for report preparation, oral presentation, poster preparation, and webpage design. The detailed evaluation forms are also included in this guide for their information. The document also includes the project proposals with the descriptions of the projects. The students are advised to read these projects descriptions very carefully. They are also encouraged to contact the supervisors of the projects for more information. Each proposal also mentions the number of students and appropriate streams which can do that project. Besides the included proposals, the students can also bring their own proposal from industry (during the industrial training they have a chance to explore such possibility) and can discuss with the relevant supervisor for possible supervision of the industrial project which they bring.

Each student should fill out the form attached at the end of this document and give it back to the department coordinator (**by May 15, 2004**). Students should form groups of 2-4 students. In this form the group of students shall prioritize four projects according to their choices. The final decision on project assignments to students will be made by the Department on the basis of the students' choices and their cumulative GPAs up until Fall' 03.

GENERAL GUIDELINES FOR REPORT PREPARATION

- Students should start writing portions of their report (for example, literature survey) as soon as they embark on a project.
- The project supervisor may assign individuals a portion of the group report to write in a team project
- Report should be prepared well advance in time before the submission deadline so that any errors in the report are rectified with the help/advice of supervisor before it is submitted. The reports which are poorly written, with typos and grammatical mistakes, leave bad impression on the examiners.
- The report should provide clear and complete referencing of the work. The next section shows how the references should be provided.
- Students should avoid copying sentences from books/reports etc. Word by word copying is considered plagiarism and is unethical.
- Report should include any necessary data used in the model. Any software developed or computer program written to achieve the project's objectives should also be included in the report. Both data and the developed computer program can be put in appendices.
- Project Report Part-II should be written as a complete report for the project and not only for Part-II. It therefore should include the work achieved both in Part-I and Part-II and should be written in a consistent manner.

HOW TO GIVE REFERENCES IN THE REPORT

As mentioned earlier, proper referencing is important. The examples below show how the references should be provided at the end of the report. Note square brackets, should be used within the text to refer to the reference. For example, [3] refers to the reference number 3 provided at the end of the report.

Book Reference:

[1] R. Billinton and R.N. Allan, *Reliability Evaluation of Power Systems*, London, Pitman, 1984.

Journal/Transaction Reference:

[2] A.S. Malik and B.J. Cory, "An Application of Frequency and Duration Approach in Generation Planning," *IEEE Transactions on Power Systems*, Vol. 12, No. 3, pp. 1076-1084, August 1997.

Conference Reference:

[3] A.S. Malik, S. Al Qatabi, T. Al Abri, M. Al Nabhani and A. Al Yafei "Economic and Technical Merits of Joint Long-Term Planning and Operation of Interconnected Power Systems: A Case Study of MHEW and PDO", *Power-Gen Middle East Conference*, Abu Dhabi, 21-23 October 2002.

Report Reference:

[4] B. Manhire, "Probabilistic simulation of multiple energy storage devices for production cost calculations", *Electric Power Research Institute,* Report No. EA-1411, May 1980.

Internet Reference:

[5] World Bank, "Expected price increase and interest rates – 1997-2006", Internet Source, June 1998.
<URL: http://www.worldbank.org/html/opr/opmanual/ops/650b.html>

Personal Communication:

[6] Personal Communication with Abdullah Al-Badri, Director North Batinah Distribution Company, Ministry of Housing, Electricity, & Water, MHEW, 2003.

GUIDELINES FOR REPORT FORMAT (PART-I)

- Maximum no. of pages: 30 (the extra material may be put in the appendices)
- Line spacing: 1.5 lines
- Margins: upper & lower: 2.5 cm; left: 3 cm; right: 2 cm
- Font: Times New Roman 12 pt
- Plan of the report:
  - ✓ Cover page
  - ✓ Abstract
  - ✓ Abstract (in Arabic)
  - ✓ Acknowledgment (optional)
  - ✓ Dedication (optional)
  - ✓ Table of contents
  - ✓ List of figures
  - ✓ List of tables
  - ✓ First chapter: Introduction
  - ✓ Other chapters may include literature survey, data collection, model setup, experimental/simulation results etc.
  - ✓ Last chapter: Conclusions/recommendations and future work for Part-II.
  - ✓ Appendices
  - ✓ References

GUIDELINES FOR REPORT FORMAT (PART-II)

- Maximum no. of pages: 60 (the extra material may be put in the appendices)
- Line spacing: 1.5 lines
- Margins: upper & lower: 2.5 cm; left: 3 cm; right: 2 cm
- Font: Times New Roman 12 pt
- Plan of the report:
  - ✓ Cover page
  - ✓ Abstract
  - ✓ Abstract (in Arabic)
  - ✓ Acknowledgment (optional)
  - ✓ Dedication (optional)
  - ✓ Table of contents
  - ✓ List of figures
  - ✓ List of tables
  - ✓ First chapter: Introduction
  - ✓ Other chapters may include literature survey, data collection, model setup, experimental/simulation results etc.
  - ✓ Last chapter: Conclusions/recommendations
  - ✓ Appendices
  - ✓ References

GENERAL GUIDELINES FOR ORAL PRESENTATION

- **Structure**

Order your thoughts into a structured manner. If a section is unnecessary to the achievement of your fundamental objectives, do not include it.

- **The Beginning**

You only have a limited time (about 20 minutes) and every minute is precious to you so, from the beginning, make it sure the audience pay attention to you. Basically, you need to start the audience thinking about the subject matter of your presentation. This can be done by a statement of your main objectives.

- **The Ending**

The final impression you make on the audience is the one they will remember. Thus it is worth planning your last few sentences with extreme care.

- **The Delivery**

Whatever you say and whatever you show; it is you, yourself which will remain the focus of the audience's attention. You should ensure that the audience is motivated and inspired rather than disconcerted or distracted. There are five key facets of the human body which deserve attention in presentation skills:

1. **The Eyes**

The eyes are said to be the key to the soul and are therefore the first and most effective weapon in convincing the audience of your honesty, openness and confidence in the objectives of your presentation. During the presentation you should use this to enhance your connection with the audience by establishing eye contact with each and every member of the audience as often as possible. A slight smile will convince each person in that direction that you have seen and acknowledged them.

2. **The Voice**

A monotone speech is both boring and sleep-inducing, so it is important to try to vary the pitch and speed of your presentation. At the very least, each new sub-section should be preceded by a pause and a change in tone to emphasize the delineation.

3. **Expression**

The audience watches your face. If you are looking unenthusiastic or distracted then they will be unenthusiastic and distracted; if you are smiling, they will be wondering why and listen to find out.

4. **Appearance**

A good formal dress appearance attracts the audience attention.

5. **Stance**

The perennial problem is what to do with your hands. These must not wave aimlessly through the air, or fiddle constantly with keys or a pen. The key is to keep your hands still, except when used in unison with your speech.

- **Some Techniques of Good Speech**

Your job is to do something, anything, which captures audience attention and makes a lasting impression upon them. Once you have planned your speech and honed it down to its few salient points, isolate the most important and devise some method to make it stick. Repeat the most important message of your speech. To attract the attention of audience use such expressions: the important point is ..... or the major finding is ….. etc. Amusing asides are also useful in maintaining the attention of the audience, and for relieving the tension of the speech. If this comes naturally to you, then it is a useful tool for pacing your delivery to allow periods of relaxation in between your sign-posted major points or between changing the speaker in a group project. If you can link your message into a story or a personal anecdote, then you can have them wanting to hear your every word - even if you have to make it up. There is no substitute for rehearsal. You can do it in front of a mirror, or with your supervisor or friend. If you get nervous just before your presentation concentrate on controlling your breathing. The good news is that the audience will never notice your nerves nearly as much as you think.

Conclusion

Once the speech is over and you have calmed down, you should try to honestly evaluate your performance. Either alone, or with the help of your supervisor or your friend in the audience, decide what was the least successful aspect of your presentation and resolve to concentrate on that point in the next talk you give.

Practice is only productive when you make a positive effort to improve – try it.

POWERPOINT PREPARATION (SOME USEFUL TIPS)

- Restrict the amount of data on any slide using as few words as possible.
- Restrict the number of slides to fit the time allocated to your presentation. For example: not more than 25 slides for a 20-minute presentation.
- For clarity use very contrasting text and background colors. A black/dark blue background, with white/yellow bold text reads well.
- **DO NOT** use any faint fonts, and avoid any non-standard fonts. Arial Bold is a good font to use. All figures and typeface should be a minimum size of Arial 24 (or equivalent)
- Leave margins of at least 1cm to prevent text being hidden during projection.
- Do not incorporate complex graphs or tables, unless they are intended purely as illustration. Slides with fine graphs or full tables of figures cannot be read from a distance.

GUIDELINES FOR PREPARATION OF THE PROJECT POSTER

Poster presentation is mandatory for completed projects, i.e., Part-II projects. The Department can provide facility to make **ONLY ONE** poster printout per final year project. The students are asked to make the poster in MS Powerpoint format or with MS Publisher. Some of the following instructions **MUST** be taken into consideration while producing the poster's file:

- Slides **(maximum of EIGHT)** should be placed in one poster size page.
- Slides should prefeably have light background (to save ink).
- Background of the poster should be white.
- See also next page for the general layout requirements.

Or use the following steps to generate your poster:

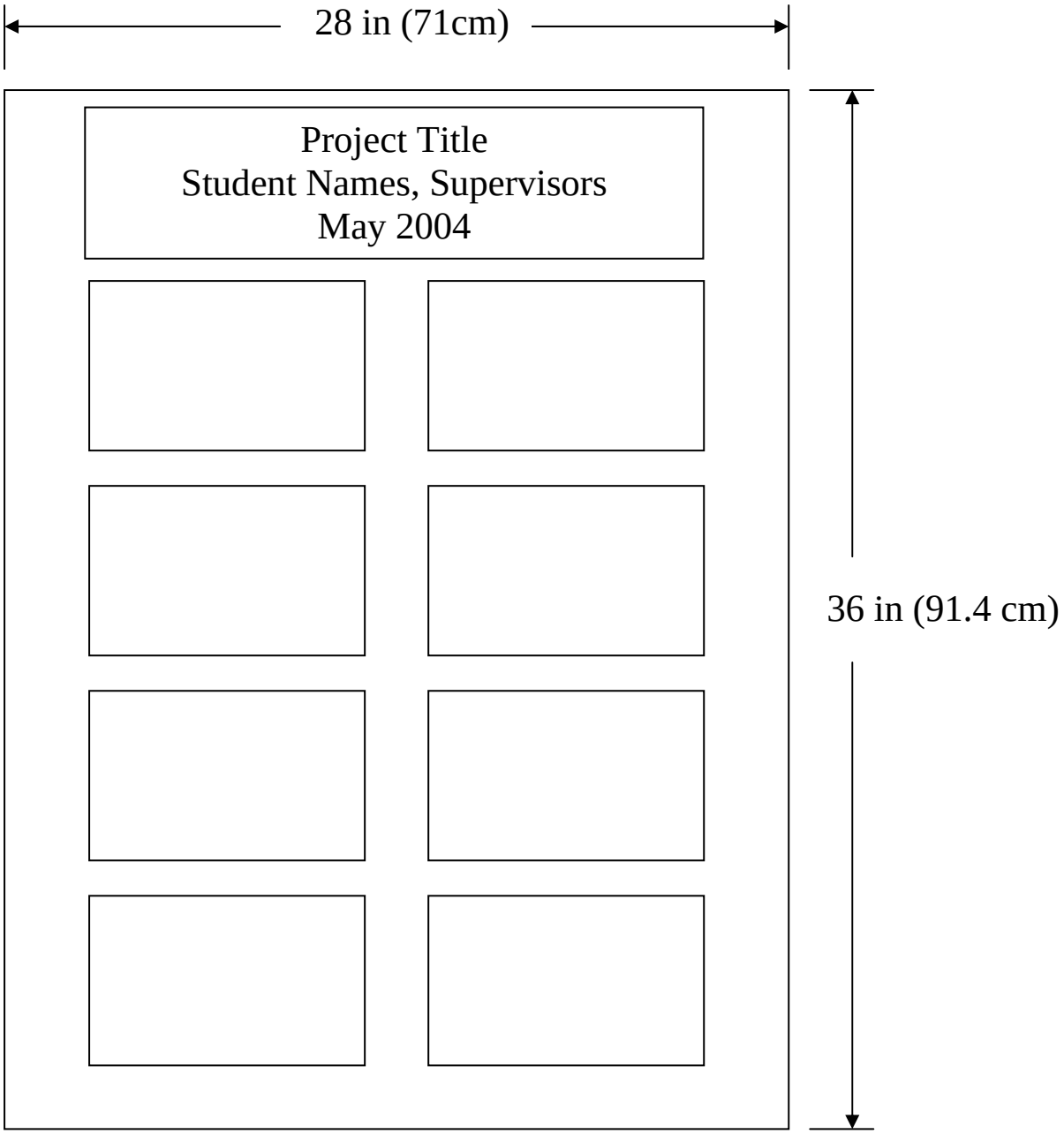
1- If you have the slides ready in Powerpoint, then make the changes, shown above, to your file.
2- Open a new file in MS PowerPoint with a new blank slide
3- Go to File>Page Setup and change the width and height of the page to 28in (71cm) and 36in (91.4cm), respectively with 2 in (5 cm) for all margins.
4- Draw frames where you are going to put your slides in the poster following preferably the layout shown in the next pages.
5- Go to your orginal powerpoint slides, select one slide, slect all items in the slide, group them, copy them, select the Poster file and paste them and move them to the place you want on the poster. Better if the fonts are big then you can resize them accordingly.
6- Repeat steps 5 for all the slides you want to copy into your poster page.
7- Look at the next page for the general layout of the poster.

After you finish creating the file save your work in a floppy disk or if it is bigger that 1.4MB try to winzip it. Sumbit the foloppy disk to the **Group Coordinator** with Project Title, your name, ID#, **GSM** and e-mail address writen on the floppy.

Poster details (see a Poster Sample):

- Width = 28 inches (71 cm)
- Hight = 36 inches (91.4 cm)
- Maximum of 8 slides
- White background (Poster)
- Light color background (slides)
- Project Title at the top with big size font
- Other details (for student's names, Advisor's, use small fonts size)

POSTER SAMPLE



GUIDELINES FOR WEBPAGE PRESENTATION

- All the students working on a final year project have to start designing and implementing their WebPages.
- They have to contact the ECE Web Committee Coordinator for allocation of disk space, passwords and login names.
- The web sites will be visited regularly by the project supervisor, the ECE Web Committee members, and other ECE staff for evaluation and comments.
- The best WebPages will be put on the internet through SQU Webpage.

DELIVERABLES FOR PART I

1. Printed copy of the Project Report (*Four* Copies)
2. Electronic copy of the Project Report to be submitted in PDF format
3. Webpage of the Project Report to be submitted in MS FrontPage

DELIVERABLES FOR PART II

1. Printed copy of the Project Report (*Four* Copies)
2. Electronic copy of the Project Report to be submitted in PDF format
3. Webpage of the Project Report to be submitted in MS FrontPage
4. Poster of the Project

This form will be updated this year.

Evaluation Form For Grading of Project Part I

Department of Electrical & Computer Engineering

Student's Name: _____

_____

ID Number: _____

			A	A-	B+	B	B-	C+	C	C-	D+	D
A.	**REPORT PREPARATION (12%)**	**%**	**4.0**	**3.7**	**3.3**	**3.0**	**2.7**	**2.3**	**2.0**	**1.7**	**1.3**	**1.0**
	Report Organization and Format	3										
	Typographical Errors	3										
	Clarity and Readability of Report	3										
	Number of pages and referencing	3										
B.	**REPORT QUALITY (12%)**											
	Literature Survey	3										
	Project Objectives	3										
	Methodology of Work	3										
	Assessment of Engineering Issues	3										
C.	**WEBPAGE DESIGN (10%)**	10										
D.	**PRESENTATION (18%)**											
	Organization	6										
	Clarity and Readability of Slides	6										
	Communication	6										
E.	**ANSWER TO QUESTIONS (17%)**											
	Project related	8										
	General Knowledge	3										
	Scientific/Engineering issues	3										
	Attitude when answering questions	3										
F.	**PROJECT ADVISOR'S GRADE (31%)**	31										
	SUM	100										
	TOTAL											
	GRADE POINT											
	LETTER GRADE											

This form will be updated this year.

Evaluation Form For Grading of Project Part II

Department of Electrical & Computer Engineering

Project Title: _____

Student's Name: _____

_____

ID Number: _____

			A	A-	B+	B	B-	C+	C	C-	D+	D
A.	**REPORT PREPARATION (12%)**	**%**	**4.0**	**3.7**	**3.3**	**3.0**	**2.7**	**2.3**	**2.0**	**1.7**	**1.3**	**1.0**
	Report Organization and Format	3										
	Typographical Errors	3										
	Clarity and Readability of Report	3										
	Number of pages and referencing	3										
B.	**REPORT QUALITY (12%)**											
	Literature Survey	3										
	Project Objectives	3										
	Methodology of Work	3										
	Assessment of Engineering Issues	3										
C.	**WEBPAGE DESIGN (10%)**	10										
D.	**PRESENTATION (7%)**											
	Organization	2										
	Clarity and Readability of Slides	2										
	Communication	3										
E.	**ANSWER TO QUESTIONS (8%)**											
	Project related & general	6										
	Attitude when answering questions	2										
F.	**PRACTICAL/TECH. EVAL. (20%)**											
	Esthetic Presentation	4										
	Relevance/Practical Application	6										
	Engineering Methodology	3										
	Completion of the Work	7										
G.	**POSTER PRESENTATION (10%)**	10										
H.	**PROJECT ADVISOR'S GRADE (21%)**	21										
	SUM	100										
	TOTAL											
	GRADE POINT											
	LETTER GRADE											

SULTAN QABOOS UNIVERSITY Date: / /
College of Engineering
Department of Electrical & Computer Engineering
B.SC. SENIOR PROJECTS
EXTERNAL EXAMINER EVALUATION FORM-

PROJECT TITLE: ……

STUDENT(S): ……..

The poster must be evaluated based on the following:

Project's Scope
Application of Science/ Engineering /Economics in the project
Practical Application to Industry
Practical Application to the Community
Poster Presentation
Organization of Poster
Clarity & readability of Poster
Correctness of Contents
Communication Skill
Answer to Questions
Project related
Scientific & General knowledge
Attitude when answering questions

Please write your mark out of TEN here!

Comments

Evaluator:
NAME: ……... SIGNATURE: …….

COMPANY: …….

ADDRESS: ……

……..……...

Phone: ……. Fax: ……..…… E-mail: ……

OPTIONAL MONITORING FORM FOR THE SUPERVISOR

Sultan Qaboos University

College of Engineering

Department of Electrical and Computer Engineering

ECCE5009 - ECCE5099
(Senior Projects: Parts I and II)

OPTIONAL MONITORING PROFORMA (CAN BE USED BY THE SUPERVISORS TO MONITOR THE PERFOMANCE OF STUDENTS)

PROJECT TITLE :

MAIN-SUPERVISOR :
CO-SUPERVISOR(S) :
WEBSITE :
DISCUSSION : At weekly project meeting and weekly follow up notebook checks.

WORK REQUIRED TO RECEIVE CREDITS

Attend all weekly project meetings, weekly follow up notebook checks, complete design proposal, complete design project within design specifications, and present and demonstrate project.

First Semester: ECCE5009

- 15% Mandatory weekly project meeting with supervisors to evaluate weekly progress in the project and to propose guidance. Notes:
  - Weekly project meetings start week 2.
  - Meeting date cannot be changed or swapped.
  - Approx. 1% Grade penalty for each weekly project meeting no-show.
  - One allowance for pre-arranged meeting absence (for interview trip, etc.)

- 15% Mandatory weekly follow-up notebook. Notebooks will be reviewed and signed by the Main Supervisor during the project office hours. Notes:
  - Notebook must be kept by each project team members.
  - Weekly follow up notebook checks start week 3.
  - Approx. 1% Grade penalty for each weekly follow up notebook check no-show.

- 37% Mid-Project Report. Required elements (See template at www page):

- Project Scope & Objectives
- Product Design Specifications
- Concept Generation.
- Concept Selection
- Project Timeline

  - Notes:
    - Each team member must submit 4 bound copies of independently prepared reports.
    - Late penalty: 5% for each day late.

- 33% Mid-Project Presentation
  - Deliverable (See template at www page):
    - Preliminary Hardware/Software/Methodology demonstration
    - Presentation of Product Design Specifications/Solution Method Description, and mid-project status.
  - Notes:
    - The mid-project briefing grade will be based on tangible evidence of project progress at the mid-project briefing.

Second Semester: ECCE5099

- 12% Mandatory weekly project meeting with supervisors to evaluate weekly progress in the project and to propose guidance. Notes:
  - Weekly project meetings start week 1.
  - Meeting date cannot be changed or swapped.
  - Approx. 1% Grade penalty for each weekly project meeting no-show.
  - One allowance for pre-arranged meeting absence (for interview trip, etc.)

- 13% Mandatory weekly follow up notebook. Notebooks will be reviewed and signed by the Main Supervisor during the project office hours. Notes:
  - Notebook must be kept by each project team members.
  - Weekly follow up notebook checks start week 1.
  - Approx. 1% Grade penalty for each weekly follow up notebook check no-show.

- 30% Final Project Technical Report
  - Deliverable:
    - Final project technical report due on May … by 4pm. Required elements (See template at www page) are: (applicable to design projects)
      - Title Page
      - Abstract (English + Arabic)
      - Acknowledgments
      - Table of Contents
      - List of Figures
      - List of Tables
      - First Chapter: Introduction

- ♦ Last Chapter: Conclusions
- ♦ Appendix
- ♦ References

- Notes:
  - ♦ For team projects, each team member must submit 4 bound copies of commonly prepared report. Each team member should specify its contribution in the report.
  - ♦ Late penalty: 5% for each day late.

➢ 40% Project presentation & Demonstration
- Deliverable: Functional Prototype/Running Simulation/Exact Solution
- Consisting of two parts (project summary presentation (30%) and demonstration (10%)).

  - The project summary presentation is a concise description of:
    - ♦ project objectives,
    - ♦ problem description,
    - ♦ method(s) of solving the problem
    - ♦ development phases and solutions,
    - ♦ testing,
    - ♦ conclusions.

  - The demonstration will be a test of the product. Three measures will be used to evaluate the demonstration:
    - ♦ percentage of proposed specifications completed,
    - ♦ percentage working at demonstration, and
    - ♦ difficulty factor.

➢ 10% Poster Presentation
- ♦ External Examiners will evaluate the project from students' poster presentation. The poster should clearly describe and summarize the whole project with emphasis on the objectives, work achieved and results, and conclusions.

General Notes:
- According to department policy, there will be no incomplete grades given except for verifiable medical reasons.
- Presentation or demonstration dates cannot be changed or swapped.

Weekly Meetings Schedule

First Semester: ( )

Week 1: Day (/ /):	Course description, e-mail addresses, selection of tasks for each team member, work ethics, weekly notebooks.
Week 2: Day (/ /):	Group meeting #1 Notebook check #1
Week 3: Day (/ /):	Group meeting #2: Notebook check #2
Week 4: Day (/ /):	Group meeting #3: Notebook check #3
Week 5: Day (/ /):	Group meeting #4: Notebook check #4
Week 6: Day (/ /):	Group meeting #5: Notebook check #5
Week 7: Day (/ /):	Group meeting #6: Notebook check #6
Week 8: Day (/ /):	Group meeting #7: Notebook check #7
Week 9: Day (/ /):	Group meeting #8: Notebook check #8
Week10: Day (/ /):	Group meeting #9: Notebook check #9
Week 11: Day (/ /):	Group meeting #10: Notebook check #10
Week 12: Day (/ /):	Mid-Project presentation rehearsal
Week 13: Day (/ /):	Mid-Project Report due: (4 bound copies) by 4pm.
Week 14: Day (/ /):	Mid-project summary presentation

End of First Semester

Second Semester: ( )

Week 1: Day (/ /):	Group meeting #1 Notebook check #1
Week 2: Day (/ /):	Group meeting #2: Notebook check #2
Week 3: Day (/ /):	Group meeting #3: Notebook check #3
Week 4: Day (/ /):	Group meeting #4: Notebook check #4
Week 5: Day (/ /):	Group meeting #5: Notebook check #5
Week 6: Day (/ /):	Group meeting #6: Notebook check #6
Week 7: Day (/ /):	Group meeting #7: Notebook check #7
Week 8: Day (/ /):	Group meeting #8: Notebook check #8
Week 9: Day (/ /):	Group meeting #9: Notebook check #9
Week10: Day (/ /):	Group meeting #10: Notebook check #10
Week 11: Day (/ /):	Group meeting #11: Notebook check #11
Week 12: Day (/ /):	Final Project presentation rehearsal
Week 13: Day (/ /):	Final Project Report due: (4 bound copies) by 4pm.
Week 14: Day (/ /):	Final Project presentation Demonstration + Poster Presentation

End of Second Semester

LIST OF FINAL YEAR PROJECTS' 04-05

#	Project Title	Main Supervisor/ Co-Supervisor(s)	Number of Students/Specialization
1	Design and Implementation of a Multi-sensor Tomography System for Real-time Process Identification.	Mahmoud Meribout	[2] Computer Networks and Systems [1] Communication & Signal Processing
2	Design and Implementation of a Low Cost Embedded Processing System for Real-time Monitoring	Mahmoud Meribout	[1] Computer Networks and Systems [1] Communication & Signal Processing
3	Design of security access control system ***(Proposed and taken by students ID # 24839 & 31715)***	Ahmed Al Naamany	[2] Communication & Signal Processing
4	Developing A WebCT-Based Courseware for *Embedded Systems Design*	Ayman Elnaggar	[3] Computer Networks and Systems
5	Virtual University- Part II	Ayman Elnaggar	[2] Computer Networks and Systems
6	Design and development of algorithmic test generation schemes for digital system testing	Afaq Ahmed	[2] Computer Networks and Systems
7	Design of a Digital Neurohardware processor For Pattern Recognition	Nazar Mohamed	[2] Computer Networks and Systems
8	Design and implementation of PKI in Oman	Ali Al Shidhani Nazar Mohamed	[2] Computer Networks and Systems
9	Design of a simulator for Interconnection Networks	Tariq Jamil	[3] Computer Networks and Systems
10	Design of a self-learning intelligent software for filtering junk email messages	Tariq Jamil	[3] Computer Networks and Systems
11	Color identification System	Mohamad Habli	[2] Computer Networks and Systems
12	Water-cut measurement using light detector	Mohamad Habli	[3] Computer Networks and Systems
13	Microprocessor based wave form generator	Afaq Ahmed	[2] Computer Networks and Systems
14	Fiber-Optic Based Instrumentation and Measurements	Farid Touati Lazhar Khriji Faical Mnif	[1] Computer Networks and Systems [3] Communication & Signal Processing
15	Design of a Speaker Recognition System using Different Classification Features and Artificial Neural Network	Abdulnasir Hossen	[3] Communication & Signal Processing
16	Design of Watermarking System for Digital Images using Wavelets Transforms	Abdulnasir Hossen	[1] Computer Networks and Systems [2] Communication & Signal Processing
17	Design and Implementation of a Wireless Local Area Network ***(Proposed and taken by students ID # 31979 & 25727)***	Joseph A. Jervase Ahmed Al-Naamany	[1] Communication & Signal Processing [1] Computer Networks and Systems
18	Design and Simulation of Antennas with MATLAB	Joseph A. Jervase	[2] Communication & Signal Processing

19	Security system design	Ali Al-Lawati	[1] Computer Networks and Systems [2] Communication & Signal Processing
20	Weather station monitoring system design	Ali Al-Lawati	[1] Computer Networks and Systems [2] Communication & Signal Processing
21	Design of Smart Wireless Telemetry System	Lazhar Khriji Farid Touati	[1] Computer Networks and Systems [2] Communication & Signal Processing
22	Design and Implementation of a Video Image Authentication System	Lazhar Khriji	[3] Communication & Signal Processing
23	Designing of an appropriate system/layout of Radio Propagation in Mobile Communication (GSM) and performing a comparative study using Path Loss.	Zia Nadir Nazar Mohammad	[3] Communication & Signal Processing
24	Design of Analogue Communications Simulation Package	Saleh Sanussi	[2] Communication & Signal Processing
25	Design of Digital Communications Simulation Package	Saleh Sanussi Joseph Jervase	[1] Computer Networks and Systems [1] Communication & Signal Processing
26	Vehicle proximity detection using Infrared Techniques	Hadj Bourdoucen	[1] Computer Networks and Systems [2] Communication & Signal Processing
27	Modeling and Analysis and Design of Wireless, Optical and None-Optical Communications Networks (Includes Planning and Traffic analysis and design)	guy Omidyar Co-(To be named)	[4] Communication & Signal Processing [2] Computer Networks and Systems
28	Investigation of Line-Insulator Design for Harsh Environments	I.A. Metwally Md. Abdus Salam	[3-4] Power Systems and Energy
29	Characterization of Leakage Current in a Contaminated Insulator Using Dimensional Analysis.	M. Abdus Salam Ali Al-Maqrashi	[2-4] Power Systems and Energy
30	Demand-Side Management Energy Saving Potential in Commercial and Other Sectors and its Impact on Power Planning – A Case study of Central Grid of Oman	Arif Malik Ali Al-Maqrashi	[2-3] Power Systems and Energy
31	Load Management by Direct Control in Industrial Sector and its Impact on Power Planning – A Case study of Central Grid of Oman	Arif Malik Ali Al-Maqrashi	[2-3] Power Systems and Energy
32	Minimization of Induced Voltages on Pipelines in Close Proximity to Overhead AC Transmission Lines by Designing a Mitigation System.	Abdullah Al-Badi Ibrahim Metwally	[2-3] Power Systems and Energy
33	Economic Dispatch of Power generation	Khaled Ellithy	[2-3] Power Systems and Energy
34	Design of a Matlab User Friendly Toolbox for Power System Voltage Stability Analysis	Khaled Ellithy Adel Gastli	[4] Power Systems and Energy
35	Design and Construction of Microprocessor Relay Test Rig	Ali Al-Maqrashi Abdullah Al-Badi	[2-3] Power Systems and Energy
36	Design and Characterization of Voltage-Sag Mitigation Methods for Large High-Voltage ESP Motors.	I.A. Metwally	[2-3] Power Systems and Energy
37	Micro-controller-based applications for Control and Instrumentation	Farid Touati Faical Mnif	[2] Computer Networks and Systems [2] Industrial Electronics & Control

38	Design & Construction of a Small-Scale Elevator System	Adel Gastli Khaled Metwally	[1] Computer Networks and Systems [1] Power Systems and Energy [2] Industrial Electronics & Control
39	Design and Implementation of a Solar Car Electric System	Adel Gastli Khaled Metwally	[1] Computer Networks and Systems [1] Power Systems and Energy [2] Industrial Electronics & Control
40	Design and Realization of a Sensorless Fuzzy Logic Controlled Induction Motor Drive	Khaled Metwally Mohamed Magdy	[2] Industrial Electronics & Control [2] Power Systems and Energy
41	Design & Implementation of SCADA System for Motoring of Power Systems Lab Simulator.	Khaled Metwally	[1] Power Systems and Energy [2] Industrial Electronics & Control
42	Real Time Computer based Control of an Irrigation System	Faical Mnif Farid Touati	[2] Computer Networks and Systems [2] Industrial Electronics & Control

[1] Project Title: Design and Implementation of a Multi-sensor Tomography System for Real-time Process Identification.

Student Specialization(s):
[1] Communication & Signal Processing [2] Computer Networks and Systems
[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors
Principal Supervisor: Dr. Mahmoud Meribout Sharing Ratio: 100%
Co-supervisor: Sharing Ratio:

Rationale

The use of process tomography has been shown to offer a new insight into a number of processes. Its power is potentially multiplied when several tomographic modalities can be used concurrently. However, current generation tomography systems are complex, expensive and have been designed primarily for the prototype laboratory. The object of this project is to design and built a multisensor system for real-time process identification. The multisensor measuring circuit and the data acquisition system will be investigated. Software for data acquisition, image reconstruction, image display and GUI will be written in C++ or Java.

Nature of the project: Design and Implementation | **Number of Students**: 2-3

Objectives:

The objectives of Project I will be:

- Study of different sensors technologies and how they can be applied for process identification;
- Design the Multisensor System and data acquisition unit;
- Design of the Software part and its hardware control unit

The objectives of Project II will be:

- Software and hardware integration;
- Overall implementation of the system.

Pre-requisites (if any):

- None

Hardware/Software items to be purchased/learned (if any): Microprocessor and/or Advanced Logic Design

Final Product (if any): A Multi-sensor Tomography System for Real-time Process

[2] Project Title: Design and Implementation of a Low Cost Embedded Processing System for Real-time Monitoring.

Student Specialization(s):

[1/2] Communication & Signal Processing [1/ 2] Computer Networks and Systems

[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Mahmoud Meribout Sharing Ratio: 100%

Co-supervisor: Sharing Ratio:

Rationale

The aggressive evolution of the semiconductor industry —smaller process geometries, higher densities, and greater chip complexity has provided design engineers the means to create complex, high-performance designs. On the other hand, in the industry, condition monitoring, which determines the machinery or process status, is highly required as it reduces abrupt stop of the production. The first goal of this project is to design and implement a new low cost and high performance embedded processing system for real-time monitoring. The second goal of the project consists then to design a software package comprising a graphical user interface, hardware drivers, and real-time monitoring algorithm.

Nature of the project: Design and Implementation

Number of Students: 2

Objectives:

The objectives of Project I will be:

- Identify different embedded hardware systems used for real-time monitoring;
- Design the embedded hardware system;
- Design of the Software part and its hardware control unit

The objectives of Project II will be:

- Overall implementation of the system.
- Software and hardware integration;

Pre-requisites (if any):

- Microprocessor and/or Advanced Logic Design.

Hardware/Software items to be purchased/learned (if any): Electronic components

Final Product (if any): A Low Cost Embedded Processing System for Real-time Monitoring

[3] Project Title: Design of security access control system

(Proposed and taken by students ID # 24839 & 31715)

Student Specialization(s):

[2] Communication & Signal Processing [ ] Computer Networks and Systems

[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Ahmed Al Naamany Sharing Ratio: 100 %

Co-supervisor: Sharing Ratio: %

Rationale

This project proposes the design, experimentation, test and installation of a security system in one of the labs and the connection of the security system to a database in a control room. The system will include a network camera, motion sensor and access control door lock. The aim is to produce an efficient, low cost and reliable security system that provides security in two significant ways. The first way is the access control of a location by allowing access to authorized personnel only while rejecting the others. The second way is the record of the activity in the lab and saving it in a computer located in a safe place, so the video can be retrieved at any time and used as evidence. This project is divided into two parts. The first part is the fingerprint identification. The stability and uniqueness of the fingerprint are well established. Upon careful examination, it is estimated that the chance of two people, including twins, having the same print is less than one in a billion. Fingerprinting is also well-established procedures especially when helping with criminal investigations, and the techniques employed by law enforcement agencies are capable of being adapted to commercial security. The second part is the network camera. Network cameras are used in professional security systems and enable live video to be viewed remotely by authorized personnel. The network cameras are easily integrated into larger, complex systems, but can also function as stand-alone solutions in entry-level surveillance applications. The output of this project can be used for surveillance of sensitive areas, such as buildings, labs, banks and shops and video of those areas can be monitored and stored in relevant control rooms, at police stations and by security managers from a variety of locations.

Nature of the project (Design/Simulation): Design and implementation	**Number of Students**: 2

Objectives:

The objectives of Project I will be:

- Identify efficient, low cost and reliable network camera and fingerprint identification access control systems.
- Experiment and implement the two systems.
- Fix the two systems in the lab.
- Test the two systems.
- Reporting the results

The objectives of Project II will be:

- Software Design of the database for access control.
- Link the network camera and the fingerprint identification access control systems with the database and test the overall system.
- Make research about:
  - Eye scan and other ID systems.
  - Gates and door locks systems.
- Reporting the final results.

Pre-requisites (if any): Introduction to Networking, Database programming and computer interface.

Hardware/Software items to be purchased/learned (if any):

Fingerprint identification system, access control door lock, network camera and database.

Final Product (if any): Access control security system in one of the department labs connected to a database in a control room.

[4] Project Title: Developing A WebCT-Based Courseware for Embedded Systems Design

Student Specialization(s):

[ ] Communication & Signal Processing [3] Computer Networks and Systems
[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Ayman Elnaggar Sharing Ratio: 100 %
Co-supervisor: Sharing Ratio: %

Rationale

Over 97% of the processors fabricated (and 50% of the revenues from processor sales) go into embedded systems. Embedded devices range from relatively simple products such as thermostats and toasters to complex applications such as ATM switches, digital cameras, automotive applications, set-top boxes, etc. Most embedded systems must meet a set of requirements - a constrained power budget, guaranteed real-time response, restricted code space due to a small memory size, code intended for a specific application and not intended to be reprogrammed by the end user, - that distinguish them from general purpose systems.

The most common three categories used in industry today are: DSP processors, PLD/FPGA-based processors, and PCI interfaces (micro-controllers).

In this project, each student will be assigned one of the above-mentioned categories. He/she is going to select one board of his/her category. The selection criteria will depend on many factors such as economical, availability, I/O bandwidth, re-programmability, power consumption, etc. Based on the chosen board, The student has to thoroughly understand the board and all its capabilities, develop 5 Lab sets including Lab Manuals (Virtual Labs will be used whenever possible), develop a complete Chapter of the courseware, prepare the WebCT materials including pool of related questions that will be integrated as part of the Virtual University project.

The students at the final presentation will compare their work, the benefits/limitations of the chosen board, propose a model that will be used in the Embedded Systems Design course.

Nature of the project: (Design/Simulation) Software/Hardware Development	**Number of Students**: 3

Objectives:

The objectives of Project will be:

- Students will learn state-of-the-art embedded systems design tools
- Students get involved in courseware preparation.
- Enhancing virtual learning

Pre-requisites (if any):

- **C or Assembly Language is a must.**
- **Excellent hardware skills.**
- **Front Page and some Web design creativities.**

Hardware/Software items to be purchased/learned (if any):

- DSP-based board.
- PCI-based microprocessors.
- Virtual Lab tools.

Final Product (if any): Courseware multimedia.

[5] Project Title: Virtual University- Part II

Student Specialization(s):

[ ] Communication & Signal Processing [2] Computer Networks and Systems
[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Ayman Elnaggar Sharing Ratio: 100 %
Co-supervisor: Sharing Ratio: %

Rationale

Oman possesses all necessary ingredients that would allow success of interactive distance learning. With highly dispersed population per area and availability of technical resources and funding it seems that allowing virtual learning would suit this region best.

In this project, students will continue working on the Virtual University (VU) model started in 2003-2004 graduate project. Virtual universities are the home of thousands of students around the world. Students can remotely enroll in the VU, attend class, have virtual tours, have virtual meetings with colleagues and instructors, participate in on-line and virtual labs, and take on-line exams.

The candidate student should be familiar HTML, Flash MX, and other multimedia software packages. JAVA programming language and Visual Basic programming experiences will be beneficial to the project too. The student is going to learn and practice many new virtual builder software packages.
In part-I, the focus was more on developing the VU model, layout, and databases.

In this part the student will work more on virtual labs, Virtual classes, and virtual meetings. A complete virtual university system is expected to be up and running by the end of the project.

Nature of the project: (Design/Simulation) Software Development | **Number of Students**: 2

Objectives:

The objectives of Project will be:

- Making the flash movies will be used in the website.
- Making the studying curriculum by using flash MX and Connecting all the flash movies and the database to the website and testing its validity.
- Starting accepting online registration of instructors and students.

Pre-requisites (if any):

- **Good programming skills.**
- **Excellent web site designing skills.**
- **Flash MX, HTML, Visual Basic, and Front Page experiences.**

Hardware/Software items to be purchased/learned (if any):

- Macromedia Flash MX
- Visual J+ +.
- Viewletbuilder.
- 2 excellent web cams at least.
- 2 excellent multimedia speaker set (microphone + speakers)

Final Product (if any): A Virtual University for Interactive E-learning.

[6] Project Title: Design and development of algorithmic test generation schemes for digital system testing

Project Specialization *(please tick one only)***:**
() Communications (x) Computers ( ) Power Systems

Supervisors
Principal Supervisor: Afaq Ahmad Sharing Ratio: 100%
Co-supervisor: None Sharing Ratio: NA

Rationale

This project entailed the development of algorithms which detect faults in combinational and sequential circuits, as well determining which chips contain faults on a board. Methods used to detect a fault in combinational circuits include; Boolean differences, fault dictionaries, and path sensitization. A method used for ascertaining fault presence in sequential circuits requires using a synchronizing sequence which guarantees the state of a machine, and then the application of a fault detection sequence.

Nature of the project: Study and design | **Number of Students**: 2

Objectives:

The objectives of Project I will be:
- Study of importance of testing
- Study of different test generation schemes
- Design of the algorithms
- Course development on WebCT

The objectives of Project II will be:
- Design of the algorithms continued
- Translation of algorithms in software;
- Analysis of the techniques.
- Course in-structuring and evaluation from WebCT

Pre-requisites (if any): None

Hardware/Software items to be purchased/learned (if any): Logic Simulator

Final Product (if any): May be (if student is versatile in programming) a software in test generation area of digital system testing

[7] Project Title: Design of a Digital Neurohardware processor For Pattern Recognition

Student Specialization(s):

[ ] Communication & Signal Processing [2] Computer Networks and Systems

[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors

Principal Supervisor: Nazar Elfadil Sharing Ratio: 100 %

Co-supervisor: Sharing Ratio: %

Rationale

This project proposes the design of a neuroprocessor core that implements the Kohonen Neural Network algorithm in silicon. The aim is to produce an efficient and reusable neuro-hardware that could be employed in a variety of pattern recognition applications. Neural Networks are models of the human brain that have shown to possess the ability to learn. This has made it very suitable for problems that conventional computers are unable to solve, such as pattern recognition. With its increasing popularity, there is now a demand for dedicated neurohardware that offers low-cost high-speed performance with a compact implementation. The proposed core implements the Kohonen Neural Network algorithm, one of the more popular neural paradigms.

Nature of the project (Design/Simulation): Design & simulation | **Number of Students**: 2

Objectives:

The objectives of Project I will be:

- Literature review of Neural networks and neuroprocessors.
- Specify the system requirements.
- Analyzed the collected data and system requirements.
- Design the proposed system.
- Reporting the outcomes.

The objectives of Project II will be:

- Develop a neuroprocessor core with following features:
  - Implement the kohonen NN algorithm.
  - High performance.
- Have a neuroprocessor core that can provide a suitable compromise between the constraints of accuracy, space and speed.
- Reporting the results.

Pre-requisites (if any): Digital logic design

Hardware/Software items to be purchased/learned (if any):

Max-plus, or VHDL and A PCI based hardware board equipped with an FPGA device is used in prototyping.

Final Product (if any): Neuroprocessor that used Kohonen neural network for pattern recognition

[8] Project Title: Design and implementation of PKI in Oman

Project Specialization

[ ] Communication & Signal Processing [2] Computer Networks and Systems
[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors

Principal Supervisor: Ali Al Shidhani Sharing Ratio: 50 %
Co-supervisor: Nazar Elfadil Sharing Ratio: 50 %

Rationale

In this design project we investigate the problem of information security threats, network threats, and explore the methods of controlling them. Within the current controlling methods there are weaknesses which may be exploded by hackers. Our goal is to produce a system that will overcome some of those threats. In this research project we will develop a secure LAN environment consisting of a host server and set of client terminals. Emphasis is made on the issues of confidentiality, authentication and information integrity. The system will contribute in establishing the infrastructure for secure E-government in Sultanate of Oman.

Nature of the project (Design/Simulation): Design | **Number of Students**: 2

Objectives:

The objectives of Project I will be:

- Literature review of Security threats, usage of cryptography and Public key infrastructure.
- Specify the system requirements.
- Analysis the colleted data.
- Design the proposed system.
- Reporting the results

The objectives of Project II will be:

- Designing a software package to generate public and private key pairs
- Issuing Digital Certificates and Digital Signatures
- Build a secure system that utilizes PKI components
- Study possibilities of implementing PKI in Oman's E-government

Pre-requisites (if any): Good knowledge in Java or C++ is preferred

Hardware/Software items to be purchased/learned (if any): C++ or Java

Final Product (if any): A software package to generate public and private key pairs as well as issuing Digital Certificates and Digital Signatures

[9] Project Title: Design of a simulator for Interconnection Networks

Student Specialization(s):

[ ] Communication & Signal Processing [3] Computer Networks and Systems

[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Tariq Jamil Sharing Ratio: 100%

Rationale

This project is basically an investigation into the world of interconnection networks (ICNs). The students are expected to explore different types of interconnection networks used in communications as well as in the field of parallel processing in computers and for several routing algorithms used in ICNs, write computer programs to simulate their working. All these computer programs will be compiled into a multimedia tutorial on the topic which will help the students in identifying the pros and cons of different types of ICNs and their routing algorithms.

Nature of the project (Design/Simulation): *Design and simulation*

Number of Students: 3 *Computer*

Objectives:

The objectives of Project I will be:

- Literature survey of Interconnection Networks
- Learning Multimedia softwares
- Coding of routing algorithms

The objectives of Project II will be:

- A Multimedia-based simulator for Interconnection Networks
- Demonstration and testing of simulator

Pre-requisites (if any): Excellent command of programming languages and knowledge of parallel processing

Hardware/Software items to be purchased/learned (if any): To be determined during Project I (if any)

Final Product (if any): A multimedia-enabled simulator for interconnection networks

[10] Project Title: Design of a self-learning intelligent software for filtering junk email messages

Student Specialization(s):

[ ] Communication & Signal Processing [2] Computer Networks and Systems
[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Tariq Jamil Sharing Ratio: 100 %

Rationale

Purpose of this project is to design a computer software which filters junk email by learning from the sample data and the mistakes it makes during the filtering process. In the beginning, the user gives sample of a junk email message and the program extracts the words and other relevant information contained in that message. This will be the initial dictionary used for filtering future email messages. Based on the assumption that another email message which contains the same words with same/similar frequency will also be a junk email message, the program will trash the other message also. If the program made a mistake in considering the second message as a trash, then the program will learn from its mistake and establish a refined dictionary/filter for future junk email messages.

Nature of the project (Design/Simulation): Design and Simulation

Number of Students: 2 Computer

Objectives:

The objectives of Project I will be:

- Literature survey of junk email filters used nowadays
- Learning AI/neural networking techniques
- Coding of software

The objectives of Project II will be:

- Fully functional self-correcting intelligent email filter software
- Demonstration and testing of software

Pre-requisites (if any): Excellent programming skills and Knowledge of artificial/neural networks

Hardware/Software items to be purchased/learned (if any): None expected

Final Product (if any): A computer software capable of filtering junk email messages.

[11] Project Title: Color identification System

Student Specialization(s):
[ ] Communication & Signal Processing [2] Computer Networks and Systems
[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors
Principal Supervisor: Dr. Mohamad Habli Sharing Ratio: 100 %
Co-supervisor: Sharing Ratio: %

Rationale

This project aims at designing an automatic Color/bar identification system. Such system has many applications such as color/bar coding.

This project involves constructing a model for the Color/bar identification system. The system consists of light dependent resistor LDR that will be used along with a microprocessor to sense different colors and patterns and to display the results.

Nature of the project: (Design/Simulation) Design | **Number of Students**:

Objectives:

The objectives of Project I will be:

1. Literature review on LDR & their application. (1.5 months)
2. LDR initial testing. (1 month)
3. LDR microprocessor interfacing (1.5 months)

The objectives of Project II will be:

1. Color identification System design & testing. (3 months).
2. Color identification System prototyping. (1 month).

Pre-requisites (if any):

Hardware/Software items to be purchased/learned (if any):

Final Product (if any): Color identification System

[12] Project Title: Water-cut measurement using light detector

Student Specialization(s):
[ ] Communication & Signal Processing [3] Computer Networks and Systems
[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors
Principal Supervisor: Dr. Mohamad Habli Sharing Ratio: 100 %
Co-supervisor: Sharing Ratio: %

Rationale

This project aims at designing a water-cut measurement system. Such system is very essential for oil industrial. It can be used to identify the water % in oil.

This project involves constructing a model for the water-cut measurement system. The system consists of a light source (Laser and/or LED) and detectors. After studying the effect of different oil samples on the light, a complete system will be constructed using microprocessor that will identifies the water-cut automatically.

Nature of the project: (Design/Simulation) Design | **Number of Students**:

Objectives:

The objectives of Project I will be:

4. Literatures review on Light detection & their application. (1.5 months)
5. Light detectors initial testing. (2 months)

The objectives of Project II will be:

1. Water-cut measuring device design & testing. (3 months).
3. Water-cut measuring device prototyping. (1 month).

Pre-requisites (if any):

Hardware/Software items to be purchased/learned (if any):

Final Product (if any): Water-cut measuring device

[13] Project Title: Microprocessor based wave form generator

Project Specialization *(please tick one only)***:**

() Communications (x) Computers ( ) Power Systems

Supervisors

Principal Supervisor: Afaq Ahmad Sharing Ratio: 100%

Co-supervisor: None Sharing Ratio: NA

Rationale

The aim of this project is to design a Microprocessor based wave form generator. The students are supposed to interface the microprocessor with programmable peripheral device along with DAC. The interfaced circuit will be capable of generating various types of wave shapes (like square, saw tooth, triangular. Trapezoidal etc.). The student will write the assembly language programs and also requires simulating on the microprocessor assembler.

Nature of the project: Study and design

Number of Students: 2

Objectives:

The objectives of Project I will be:

- Practice of Assembly Language Programming
- Interfacing DAC/ or and utilizing interfaced DAC.
- Design of the Software part for the function generator.

The objectives of Project II will be:

- Interfacing PPI / or and utilizing interfaced PPI.
- Software and hardware integration;
- Overall implementation of the techniques; testing and validation

Pre-requisites (if any): None

Hardware/Software items to be purchased/learned (if any): Assembler

Final Product (if any): Design demonstration

[14] Project Title: Fiber-Optic Based Instrumentation and Measurements

Student Specialization(s):

[**3**] Communication & Signal Processing [1] Computer Networks and Systems
[0] Industrial Electronics & Control [0] Power Systems and Energy

Supervisors

Principal Supervisor: Farid Touati Sharing Ratio: 40 %
Co-supervisor: Lazhar Khriji Sharing Ratio: 30%
Co-supervisor: Faical Mnif Sharing Ratio: 30%

Rationale

Fiber-optic based instrumentation has been gaining grounds over the conventional cable-based one by virtue of:

- Superior performance features: remote monitoring, higher reliability, and immunity against noise and EMI
- Compatibility with standard SONET/SDH protocols
- Operation in harsh environment, e.g., high temperature, high irradiation, etc.

Major sectors in the world industry today have been shifting gradually toward fiber-based surveillance and instrumentation. This has resulted in better production due to reduced interruption, less intervention, and better performance monitoring.

This type of projects is of multidisciplinary nature, in that, it requires background in communications, computers, and electronics. Therefore, as such constitute potential capstone projects for the Electrical and Computer Engineering (ECE) final-year students.

In this project, the students will work on designing and implementing a fiber-optic based instrumentation that comprises three main parts:

1. Sensor and signal conditioning part: e.g. for temperature, level, or pressure measurement
2. Fiber-optic link: transmitter, fiber, and receiver (provision: link be purchased).
3. Computer-based data acquisition and monitoring part

The project, through its different phases, exposes the students to so many engineering practices (technical, economical and environmental), and hence, give them confidence being on the offshore of the job market.

Nature of the project: Design and implementation | **Number of Students**: 4 Preferably 3/1/0/0

Objectives:

The objectives of Project I will be:

- Learn and investigate different types of fiber optic transceivers (with fibers) both analog and digital, pc interfaces (ADC, multiplexer, data acquisition card), and sensors (e.g. temperature, level, pressure). The selection of components will be based on suitability of technical specifications and cost.
- Select required hardware components and order to purchase
- Go into deep and concentrate on studying the selected hardware components:
  - Analog or digital optical transceivers: hardware architecture and specifications (Data Sheet)
  - Data acquisition card (if needed; students decide): hardware architecture and specifications (Data Sheet)
  - Sensors: temperature, level, or/and pressure: specifications (Data Sheet)
  - After the purchase is done: test the different components for operation and write/test the program to read and display the data received trough the fiber and acquisition card.
- Write the report of Project I and design a website.

The objectives of Project II will be:

- Have the students "ready to go": get well caught up with the optical transceiver operation and various components, that to be used, in the project
- Set up and test the whole system (i.e. sensors – optical link – pc data monitoring)
- Draw conclusions and recommendations
- Write the report of Project II and complete the website.

Pre-requisites (if any): Strong programming skills (e.g. Visual Basic, LabView), interest in optical communications

Hardware/Software items to be purchased/learned (if any): Optical transceiver, sensors, data acquisition card and software, others.

Final Product (if any): A fiber-optic based prototype for instrumentation and measurements.

[15] Project Title: Design of a Speaker Recognition System using Different Classification Features and Artificial Neural Network

Student Specialization(s):

[3] Communication & Signal Processing [ ] Computer Networks and Systems
[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors

Principal Supervisor: Abdulnasir Hossen Sharing Ratio: 100%
Co-supervisor: Sharing Ratio:

Rationale

Speaker recognition is the process of automatically recognizing the speaker on the basis of individual information included in speech signals.
This methodology uses the speaker's voice to verify their identity and control access to services such as voice dialing, banking by telephone, telephone shopping, voice mail, security control and remote access to computers.
A speaker recognition system consists of two main modules: feature extraction and feature matching. Feature extraction is the process that extracts a small amount of data from the voice signal of each speaker for parametrically representing the speaker signal for the recognition task.

Nature of the project: Design simulation | **Number of Students**: 3

Tasks:

The tasks of Project I will be:

- Literature review
- Designing a feature extraction system based on different classification features such as: Linear predictive coding, Mel-frequency cepstrum analysis, Formant analysis, Wavelet decomposition.
- Designing a feature matching (pattern recognition) system based on vector quantization (VQ) method.
- Write the report of project 1 and design a website.

The tasks of Project II will be:

- Build a complete system based on different features.
- Compare the recognition efficiency and computational complexity.
- Design an artificial neural network based on different features to have a best efficiency system.
- Write the report of project II and complete the design of the website and design a poster.

Pre-requisites (if any):
Digital signal Processing

Hardware/Software items to be purchased/learned (if any): MATLAB

Final Product (if any): A MATLAB based Software for Design of Automatic Speaker Recognition System

[16] Project Title: Design of Watermarking System for Digital Images using Wavelets Transforms

Student Specialization(s):
[2] Communication & Signal Processing [1] Computer Networks and Systems
[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors
Principal Supervisor: Abdulnasir Hossen Sharing Ratio: 100%
Co-supervisor: Sharing Ratio:

Rationale

A digital watermark is a short sequence of information, which consists of owner's identity or copyright information. In principle, a digital watermark is an invisible mark inserted in digital media such as digital images, video and audio, so that it can be detected at a later stage for evidence of copyright or generally against any illegal attempt to change their identity. The frequency domain approaches are the most successful for image watermarking. Transformation such as FFT, DCT, DWT are good examples for such application. The DWT-based watermarking system consists of encoder and decoder subsystems.

Nature of the project: Design, Simulation

Number of Students: 3
2-1-0-0 / 1-2-0-0 / 3-0-0-0 /0-3-0-0

Tasks:

The tasks of Project I will be:

- Literature review
- Designing the Encoder Part:

1. Decompose the input signal into number of frequency bands.
2. Select the most suitable coefficients that achieve the best compromise between visibility and robustness.
3. Add the watermarked information to an extent that it is invisible.
4. Inverse DWT.

- Designing the Decoder part:

1. DWT of the received image.
2. Isolating the signature included in the image by comparing the DWT coefficients of the received image with those of the original one.
3. Extract the watermarked information from the received image by correlation technique.

- Write the report of project I, and design a website.

The tasks of Project II will be:

- Design a complete wavelet-based watermarking system for digital images.
- Testing the system under different attacks: noise, artifacts, half-toning, filtering.
- Find the accuracy of the system.
- Write the report of project II and complete the design of the website and design a poster.

Pre-requisites (if any):
Digital signal Processing

Hardware/Software items to be purchased/learned (if any): MATLAB

Final Product (if any): A MATLAB Based Digital Image Watermarking System

[17] Project Title: DESIGN AND IMPLEMENTATION OF A WIRELESS LOCAL AREA NETWORK©

(Proposed and taken by students ID # 31979 & 25727)

Student Specialization(s):

[1] Communication & Signal Processing [1] Computer Networks and Systems

[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors

Principal Supervisor: Joseph A. Jervase Sharing Ratio: 50 %

Co-supervisor: Ahmed Al-Naamany Sharing Ratio: 50 %

Rationale

The objective of this project is to expose the students to a major design experience. The necessary background knowledge to carry out the design is in courses already taken or through self study and research.

The students are expected to design and implement a Wireless Local Area Network (WLAN) for the first phase of the project. A Wireless Local Area Networking (WLAN) connects two or more computers via radio signals, allowing shared files, printers, or Internet access. Hence, it provides all the features and benefits of traditional LAN technologies such as Ethernet and Token Ring, but without the limitations of wires or cables. The second phase of the project will deal with identifying new techniques of security and quality of service in WLAN. The economic aspects of the project will also be covered in this phase.

Nature of the project: Design & Implementation

Number of Students: 2

Tasks:

The tasks of Project I will be:

1. Design a WLAN for the entire new engineering building
2. Implement a WLAN for the ECE staff in the new engineering building
3. Test the implemented WLAN

The tasks of Project II will be:

1. Identify new techniques of security in WLAN
2. Identify new techniques of quality of service in WLAN
3. Present an economic appraisal of the project

Pre-requisites (if any):

Hardware/Software items to be purchased/learned (if any):

Access Points, Wireless NIC

Final Product (if any): Working WLAN

[18] Project Title: DESIGN AND SIMULATION OF ANTENNAS WITH MATLAB

Student Specialization(s):

[2] Communication & Signal Processing [0] Computer Networks and Systems
[ ] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors

Principal Supervisor: Joseph A. Jervase Sharing Ratio: 100 %
Co-supervisor: Sharing Ratio: 0 %

Rationale

Antennas play a crucial role in any communication link where part of the signal has to travel through free space. The most prevalent type is the microstrip patch antenna on the mobile handsets. Antenna characteristics such as gain, radiation pattern and impedance are critical in its performance and are thus the input parameters in the design of any antenna.

The objective of this project is to expose the students to a design experience using MATLAB as the main tool. The students are expected to design and simulate a number of antennas. They will be expected to write the design and simulation scripts. As a final product, they are expected to use the MATLAB GUI for developing a user friendly package for design of antennas.

Nature of the project: Design & Implementation | **Number of Students**: 2

Tasks:

The tasks of Project I will be:

4. Review of Antenna Theory
5. Review of MATLAB
6. Design and Simulation of Dipole and Monopole Antennas

The tasks of Project II will be:

4. Design and simulation of complex antenna structures
5. Development of a GUI for the design and simulation of antennas
6. Present cost of design of one specific type of antenna

Pre-requisites (if any):

Antenna Theory

Hardware/Software items to be purchased/learned (if any):

MATLAB

Final Product (if any): A MATLAB based Software for Design of Antennas

[19] Project Title: Security system design**.**

Student Specialization(s):
[2] Communication & Signal Processing [1] Computer Networks and Systems
[] Industrial Electronics & Control [] Power Systems and Energy

Supervisors
Principal Supervisor: Ali Al-Lawati Sharing Ratio: 100%
Co-supervisor: Sharing Ratio:

Rationale

The aim of this project is to subject the students to a major design experience. The design depends on tools some of it already taught to the student and other tools the student has to search for and learn by him/her self. This could be achieved with further gain by designing a system widely utilized by the community to elevate the students' sense of community service importance.

The students are expected to design a security system that monitors a typical urban building. This could include a multi zone alarm, burglary alarm, glass breakage alarm and smoke detectors. The students shall do a comprehensive study and design of different electronic circuits to monitor the building security and with the aid of a microcontroller the different inputs will be displayed in a convenient format. Financial aspects will also be studied and price lists of the final design will be prepared.

Although all the students will work on all tasks listed below and will be responsible of every part of the project, student "1" will focus more on the electronics design, student "2" will focus more on the microcontroller programming and student "3" will focus more on simulations and financial aspects.

Nature of the project: Design, simulation and possibly Construction	**Number of Students**: 3 Preferably (2-1-0-0)

Tasks:

The tasks of Project I will be:

- Litrature review about:
  - Basics of security systems.
  - Electronics in security systems.
  - Microcontrollers.
  - Review of machine language.
- Design of electronic circuits.
- Simulations (Orcade, PSpice or similar software).

The tasks of Project II will be:

- Write programs to collect data from sensors and display it.
- Integrate the security system with the microcontroller.
- Prepare a complete system design including price lists.
- Build the system (if resources available)

Pre-requisites (if any):
General knowledge of electronics and machine language

Hardware/Software items to be purchased/learned (if any): Microcontrollers, electronic components & sensors. (if available)

Final Product (if any):

[20] Project Title: Weather station monitoring system design.

Student Specialization(s):
[2] Communication & Signal Processing [1] Computer Networks and Systems
[] Industrial Electronics & Control [] Power Systems and Energy

Supervisors
Principal Supervisor: Ali Al-Lawati Sharing Ratio: 100%
Co-supervisor: Sharing Ratio:

Rationale

The aim of this project is to subject the students to a major design experience. The design depends on tools some of it already taught to the student and other tools the student has to search for and learn by him/her self. This could be achieved with further gain by designing a system widely utilized by the community to elevate the students' sense of community service importance.

The students are expected to design a weather monitoring system that measures several parameters such as rain precipitation, wind speed, temperature and pressure. The students shall do a comprehensive study and design of different electronic circuits to measure the weather parameters and with the aid of a microcontroller the different readings will be displayed in a convenient format. Financial aspects will also be studied and price lists of the final design will be prepared.

Although all the students will work on all tasks listed below and will be responsible of every part of the project, student "1" will focus more on the electronics design, student "2" will focus more on the microcontroller programming and student "3" will focus more on simulations and financial aspects.

Nature of the project: Design, simulation and possibly Construction	**Number of Students**: 3 Preferably (2-1-0-0)

Tasks:

The tasks of Project I will be:

- Litrature review about:
  - Basics of weather stations' measurements.
  - Electronics in weather measurement stations.
  - Microcontrollers.
  - Review of machine language.
- Design of electronic circuits.
- Simulations (Orcade, PSpice or similar software).

The tasks of Project II will be:

- Write programs to collect data from sensors and display it.
- Integrate the weather station with the microcontroller.
- Prepare a complete system design including price lists.
- Build the system (if resources available)

Pre-requisites (if any):
General knowledge of electronics and machine language

Hardware/Software items to be purchased/learned (if any): Microcontrollers, electronic components & sensors. (if available)

Final Product (if any):

[21] Project Title: Design of Smart Wireless Telemetry System

Project Specialization *(please tick one only)***:**
[**2**] Communication & Signal Processing [**1**] Computer Networks and Systems
[**0**] Industrial Electronics & Control [0] Power Systems and Energy

Supervisor: Lazhar Khriji Sharing ratio: 60 %
Co-Supervisor: Farid Touati Sharing ratio: 40 %

Rationale

The goal of this project is to build a complete wireless system transmitting information (Temperature, Pressure, Humidity…) from different hosts (nodes) to a remote location. The hosts should be controllable by receiving decisions from headquarter.
In this project, the students will work on designing and implementing a wireless-based transmission system that comprises three main parts:

4. Sensor and signal conditioning part: e.g. for temperature, pressure, or Humidity measurement.
5. Wireless transceivers.
6. Computer-based data acquisition and monitoring part

This type of projects is of multidisciplinary nature. There is significant flexibility in the dynamic analysis methods to be considered here (wide range of sensors), permitting the project participants to tailor this project somewhat to their own interests (safe transmission).

Nature of the project: Design and Implementation

Number of Students: 3.
Preferably: 2-1-0-0

Objectives:

Objective Part I:

- Literature review on Sensors (e.g. temperature, level, pressure) and sensor systems, transceivers, PC Interfac (ADC, Multiplexer, Data acquisition card). The selection of components will be based on suitability of technic specifications and cost.
- Using the Visual Basic Software, generate, send, receive, and display information (data)

Objective Part II:

- Set up and test the whole system (i.e. sensors – wireless link – PC data monitoring)
- Application: read and display the evolution of the temperature of different nodes for example.

Pre-requisites (if any): Visual Basic, DSP

Hardware/Software items to be purchased/learned (if any): Transceivers, sensors, data acquisition card and software, others.

Final Product (if any): A Wireless Telemetry System.

[22] Project Title: Design and Implementation of a Video Image Authentication System

Project Specialization *(please tick one only)***:**
[**3**] Communication & Signal Processing [0] Computer Networks and Systems
[**0**] Industrial Electronics & Control [0] Power Systems and Energy

Supervisor: Lazhar Khriji Sharing ratio: 100 %
Co-Supervisor:

Rationale

In the emerging multimedia world, manipulating images has become easier. Any PCs offer software that can easily add or delete objects. The current limitations concern user capability. Those modifications are generally aimed to enhance the content of an image, but these tools can also be used to tamper it. The quality of the manipulations can be excellent, thus methods and tools that can help the authentication process are needed. In the courtroom, insurance company, hospital, newspaper, or television news, indeed, when we look at an image or we watch a movie clip, we would like to be sure that the image or the video is real and not tampered with. The goal of this project is to develop a method for the authentication of digital video sequences. The main hypothesis behind this work is that the composite sequence has imperfections, which are typically defects due to different illumination conditions. The problem of lighting has been addressed for several years for applications such as image creation. Using a developed tool for shadow detection together with an estimate of the direction of light sources, an analysis of the coherence of illumination conditions in the manipulated scene will verify its authenticity.

The developed algorithm will serve then to process the sequences filmed by the MPEG-7 digital video camera and to define a set of tests based on different features helping experts to decide if an image (sequence) is a composite.

Nature of the project: Design & Simulation | **Number of Students**: 3 Communications

Objectives: This project focuses on the authentication of digital video sequences. The objects should be automatically segmented and tracked along time, based on a two-stage procedure,

Objective Part I:

In the first stage, an adaptive change detection algorithm should identify the objects from the background. The color difference between frames will be modeled so as to separate the contributions caused by sensor noise and illumination variations from those caused by meaningful objects. Using a probability-based classification can eliminate sensor noise, whereas local illumination variations can be removed using a knowledge-based approach (formulated as a hypnotizes and test scheme). Furthermore, the change detection algorithm relies on color edges to adapt to global illumination variations.

Objective Part II:

In the second stage, a segmentation tool based on multi-feature analysis further segments the areas corresponding to objects into homogeneous regions. For each region, the method should produce a set of characteristic descriptors, and not regions themselves, to track the regions (and thus the objects) along time. Track management issues such as appearance and disappearance of objects, splitting and partial occlusions can be resolved through interactions between regions and objects.

Pre-requisites (if any): Matlab, DSP

Hardware/Software items to be purchased/learned (if any):

Final Product (if any): Video Image Authentication System.

[23] Project Title: Designing of an appropriate system/layout of Radio Propagation in Mobile Communication (GSM) and performing a comparative study using Path Loss.

Student Specialization(s):

[**3**] Communication & Signal Processing [0] Computer Networks and Systems
[0] Industrial Electronics & Control [0] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Zia Nadir Sharing Ratio: 67 %
Co-supervisor: Dr. Nazzar Mohammad Sharing Ratio: 33 %

Rationale

The cellular mobile communication industry has recently been one of the fastest growing industries. Need for high quality and high capacity networks and estimation of coverage accurately has become extremely important. The RF propagation prediction algorithms based on empirical results give only approximate coverage and are not suitable for detailed network design. Therefore for more accurate design coverage of modern cellular networks, signal strength measurement must be taken in the service area using a test transmitter. Installing and measuring signal strength is an expensive and time-consuming task. Propagation Path Loss model is the fundamental method of predicting the range of a mobile system.

In the project students have to familiarize with the software and investigate different constraints in Radio Propagation Path Loss. They have to design the system between two buildings for minimal path loss and propose the modification in Path Loss software, if any. The actual data is to be acquired from literature or Omantel for proper comparison and analysis.

Nature of the project (Design/Simulation): Design/ Simulation	**Number of Students**: 03

Tasks:

The tasks of Part I will be:

- Literature review.
- Study of Theoretical Propagation Models.
- Acquiring actual data from literature/ Omantel.
- Familiarization with Path Loss Software.

The tasks of Part II will be:

- Simulating different setups using the software.
- Investigating different parameters, which effect radio propagation.
- Presenting the results and proposing the possible suggestions.

Pre-requisites (if any): Antenna and wave Propagation course.

Hardware/Software items to be purchased and learned (if any): Path Loss

Final Product (if any): Nil

[24] Project Title: **Design of Analog Communications Simulation Package**

Student Specialization(s):

[**2**] Communication & Signal Processing [0] Computer Networks and Systems

[0] Industrial Electronics & Control [0] Power Systems and Energy

Supervisors

Principal Supervisor: Saleh Sanussi Sharing Ratio: 100 %

Rationale

System simulation is an essential part of the system design process, and students can benefit from early exposure to system simulation and simulator design. This project intends to design a simulator of Analog Communications systems which are taught to undergraduate students at Sultan Qaboos University.

The objective of this project is to introduce the students to a design experience where they will investigate different simulation methods, and programming environments, and select one to design their simulator.

The students should expect to design and test the simulation routines for a number of Analog Communications topics. A Software package for simulating Analog Communications, complete with a graphical user interface is to be developed. The existing Communications Lab experiments can be considered as a relevant set of topics.

Nature of the project: Design and implementation	**Number of Students**: 2 2/0/0/0

Tasks:

The tasks of Project I will be:

7. Review of Analog Communications.
8. Selection of topics to be simulated and the simulation environment.
9. Writing of programming modules.

The tasks of Project II will be:

7. Merging and testing all modules.
10. Developing the Graphical User Interface (such as in Matlab).

Pre-requisites (if any): Communications LabI
Interest in Analog Communications, Lab. work and programming.

Hardware/Software items to be purchased/learned (if any):

Final Product (if any): Software package for simulating Analog Communications.

[25] Project Title: **Design of Digital Communications Simulation Package**

Student Specialization(s):

[**2**] Communication & Signal Processing [0] Computer Networks and Systems
[0] Industrial Electronics & Control [0] Power Systems and Energy

Supervisors

Principal Supervisor: Saleh Sanussi Sharing Ratio: 50 %
Co-supervisor: Joseph Jervase Sharing Ratio: 50 %

Rationale

System simulation is an essential part of the system design process, and students can benefit from early exposure to system simulation and simulator design. This project intends to design a simulator of Digital Communications systems which are taught to undergraduate students at Sultan Qaboos University.

The objective of this project is to introduce the students to a design experience where they will investigate different simulation methods, and programming environments, and select one to design their simulator.
The students should expect to design and test the simulation routines for a number of Digital Communications topics. A Software package for simulating Digital Communications, complete with a graphical user interface is to be developed. The existing Communications Lab experiments can be considered as a relevant set of topics.

Nature of the project: Design and implementation	**Number of Students**: 2 2/0/0/0 or 1/1/0/0

Tasks:

The tasks of Project I will be:

11. Review of Digital Communications.
12. Selection of topics to be simulated and the simulation environment.
13. Writing of programming modules.

The tasks of Project II will be:

8. Merging and testing all modules.
14. Developing the necessary hardware interface and the Graphical User Interface.

Pre-requisites (if any): Communications LabI
Interest in Analog Communications, Lab. work and programming (e.g. Matlab, Visual Basic).

Hardware/Software items to be purchased/learned (if any):

Final Product (if any): Software package for simulating Digital Communications.

[26] Project Title: Vehicle proximity detection using Infrared Techniques

Student Specialization(s):

[**2**] Communication & Signal Processing [**1**] Computer Networks and Systems
[**-**] Industrial Electronics & Control [-] Power Systems and Energy

Supervisors
Principal Supervisor: Dr. Hadj Bourdoucen Sharing Ratio: 100%
Co-supervisor: Sharing Ratio: 0%

Rationale

With increasing number of accidents in Oman and elsewhere, it becomes necessary to look at this serious problem and present suggestions to reduce it. This project is an attempt to save lives and to decrease the number of accidents by designing and implementing a low cost system for proximity vehicle detection. The main objective is to design and implement an infrared communication system that transmits and collects signals to and from other vehicle(s) moving at proximity. Based on given critical distance and speed of the vehicle, the system warns the drivers of the two vehicles (or more) of the danger that might end up with an accident.

Nature of the project: Design , Simulation, Implementation	**Number of Students**: 3 Preferably (2-1-0-0), **(3-0-0-0) is also Okay**

Objectives:

The objectives of Project I will be:

- Literature survey on Optical Infrared communication techniques & systems.
- Impairments associated with these systems
- Selection of approach to be used for implementation.
- Design of the system.

The objectives of Project II will be:

- Simulation and Implementation
- Tests and troubleshooting
- Performance evaluation
- Conclusions

Pre-requisites (if any):

- General knowledge of Optical communication.
- Some programming

Hardware/Software items to be purchased/learned (if any): Electronic Hardware (components)

Final Product (if any): Infra Red Collision Warning System

[27] Project Title: Modeling and Analysis and Design of Wireless, Optical and None-Optical Communications Networks (Includes Planning and Traffic analysis and design)

Project Specialization:

[**4**] Communication & Signal Processing [**2**] Computer Networks and Systems

[**0**] Industrial Electronics & Control [**0**] Power Systems and Energy

Supervisors

Principal Supervisor: Prof guy Omidyar Sharing Ratio: 80 %

Co-supervisor: To be named Sharing Ratio: 20 %

Objectives

The objective of this project exercise and development is to develop software package tools to perform modeling and design of practical large scale wireless, optical and none-optical Communications Networks, computer communications Networks.

In this project students have to get familiarize with the software package tools off the shelves and develop planning and design algorithms which leads itself to design modeling and simulation tools. At a later time this information will be used to develop a software package tool for commercialization

Resources:

Companies: Interfaces with industry, e.g., included RSOFT, VPI systems, Ciena, Nortel, Cisco OpNet and other relevant companies as needed and as it is appropriate.

References: Relevant Books and technical papers written at the present and in the past.

Nature of the project: Research and design and development (Analysis and design, modeling and simulation of high speed networks), teleprocessing and traffic engineering	**Number of Students**: **6** [**4, 2, 0, 0**]

Tasks:

The tasks include (phase I):

- Survey of current literature.
- Review appropriate technical papers submitted to conferences and journals as appropriate
- Survey of existing planning and design tools available in the market and off-the-shelves as appropriate.
- Purchase modeling tools to work with (hands on, plug and play), learn and be able to work with the network design tools while developing communications networks modeling algorithms.
- Interface with Industry, get familiar with different manufacturers and equipments, tools and techniques
- Get familiar with exiting network algorithms.

The tasks include (phase II):

- Create different Scenarios of networks topology and connectivity (Wireless, Optical and none optical Communications Networks)
- Investigate different parameters, which affect the design and performance of the model.
- Develop design algorithms for large scale Teleprocessing Networks.
- Presenting the results (Including design algorithms, configurations scenarios, connectivity and topology, equipment layout from different manufacturers, including performance evaluations and traffic loading.

Pre-requisites (if any): familiar with Wireless, Optical and none-Optical Communications Networks.

Hardware/Software items to be purchased and learned (if any): Modeling and simulation tools off -the- shelves (To be Identified).

Final Product (if any): Development algorithms for Wireless, Optical and none-Optical Communications Networks and possible coding into software package tools. If time permits, to develop the software package tool for commercialization.

[28] Project Title: Investigation of Line-Insulator Design for Harsh Environments

Student Specialization(s):

[ ] Communication & Signal Processing [ ] Computer Networks and Systems
[ ] Industrial Electronics & Control [3-4] Power Systems and Energy

Supervisors

Principal Supervisor: I.A. Metwally Sharing Ratio: 67 %
Co-supervisor: Md. Abdus Salam Sharing Ratio: 33 %

Rationale

Line insulators are the main part of transmission and distribution networks. Insulator contamination has been identified as the most important factor for the high-voltage transmission and distribution network inadvertent outages. Transmission lines pass nearby desert, seaside and industrial areas. Depending on the sites, contaminants can be classified as: (1) sand and dust near desert area, (2) NaCl and small rock originating from seawater, and (3) smoke and dust coming from the industrial area. Overhead line components like insulators, crossarms and poles are contaminated by the abovementioned contaminants. The surface contamination of overhead component remains one of the major maintenance problems for many coastal and desert power utilities. These pollutants on the insulator surface provides conductive path when wetted by light rain and dews. Leakage current starts to flow through the insulator surface and forms dry-band, and finally flashover and/or pole fires (for wooden poles). Insulators with different designs will be modeled with and without pollution. Also, lab tests will be conducted to show the performance of these insulators under harsh environments.

Nature of the project: Design, simulation and lab tests | **Number of Students**: 3-4

Objectives:

The objectives of Project I will be:

- Literature survey for all types of line insulators.
- Comparison of the pollutant density and the type and creepage distance of insulators in the IEC standard.
- Familiarization with the software.
- Preliminary lab tests.

The objectives of Project II will be:

- A comparative simulation of the design of line-insulators used in Oman.
- Comprehensive lab investigations to measure the leakage current, withstand and flashover voltages under different pollution conditions.
- Comparison between the results of the lab tests and the theoretical simulation.
- Selection of the best insulator design and material for Oman territory.

Pre-requisites (if any): Co-requisite (High Voltage Engineering ECCE5332)

Hardware/Software items to be purchased/learned (if any): SLIM software

Final Product (if any): Computer models and test setup.

[29] Project Title: Characterization of Leakage Current in a Contaminated Insulator Using Dimensional Analysis.

Student Specialization(s):

[ ] Communication & Signal Processing [ ] Computer Networks and Systems
[ ] Industrial Electronics & Control [2-4] Power Systems and Energy

Supervisors

Principal Supervisor: M. Abdus Salam Sharing Ratio: 75 %
Co-supervisor: Ali Al-Maqrashi Sharing Ratio: 25 %

Rationale

Unit is an important term for all engineering fields. The unit is divided into two types; one is a fundamental and other is derived unit. Since long, the derived unit is using for doing research work in the field of Mechanical Engineering. Recently, the derived unit is using for modeling high voltage quantities like flashover voltage, leakage impedance etc.
The leakage current is an important parameter to identify the threshold voltage for surface flashover of a contaminated insulator. In this project, the dimensional analysis will be used to characterize the leakage current in a contaminated insulator. The theoretical results will also be verified by the experiment.

Nature of the project: (Design/Simulation)	**Number of Students**: 2-4

Objectives:

The objectives of Project I will be:

- Literature survey
- Choosing related parameters to characterize leakage current
- Derive the unit of the related parameters in terms of fundamental units
- Develop the model in terms of related parameters
- Preliminary lab testing using contamination

The objectives of Project II will be:

- Enhance the lab testing with different combination of contamination (IEC standard)
- Finding the dimensional constants
- Comparison between the experimental and the theoretical results
- Verification of results by regression analysis

Pre-requisites (if any): ELEC 3421

Hardware/Software items to be purchased/learned (if any):

Final Product (if any): None

[30] Project Title: Demand-Side Management Energy Saving Potential in Commercial and Other Sectors and its Impact on Power Planning – A Case study of Central Grid of Oman

Student Specialization(s):

[ ] Communication & Signal Processing [ ] Computer Networks and Systems
[ ] Industrial Electronics & Control [2-3] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Arif Malik Sharing Ratio: 67 %
Co-supervisor: Dr. Ali Al-Maqrashi Sharing Ratio: 33 %

Rationale

Demand-Side Management (DSM) is actually planning, implementing, and evaluation of utility sponsored programs to influence the amount or timing of customers' energy use. DSM is a resource option complementing power supply. DSM has a very positive environmental outlook as it provides the best solution between load growth and increasing constraints on new and existing generation, transmission and distribution capacity. DSM programs use a variety of different means to manage electricity demand such as strategic conservation, peak clipping, valley filling, load shifting, strategic load growth etc. Strategic conservation involves reducing the demand for electricity without any shift in demand to another time. Peak clipping reduces electricity demand during on-peak periods of the day, thereby lowering the peak demand that utilities must meet. Conversely valley filling increases the electrical load during off-peak periods, while load shifting is the movement of loads from peak to off-peak periods without any shift in energy use pattern. There are a variety of DSM resource options like energy efficiency options (energy efficient appliances and lighting, high efficiency heating, ventilating and A/C, efficient motors, variable speed drive motors), load management and tariff options (time-of-use, interruptible, incentives). This project will make an effort to estimate the DSM energy saving potential in commercial and other sectors of Oman (Central Grid area) and evaluate its impact on generation capacity and energy saving.

Nature of the project: Planning/Simulation it has got economic and environmental component into it.	**Number of Students**: 2-3

Objectives:

The objectives of Project I will be:

- Survey of existing literature, reports and project proposals relating to DSM and power loss reduction in Central Grid of MHEW
- Identify gaps/new areas that need to be addressed in terms of DSM
- Estimate DSM energy saving potential in commercial sector (efficient cooling and lighting)
- Estimate DSM energy saving potential in other sectors such as agricultural, residential, institutional etc.
- Modify the load forecast of Central grid based on the estimated DSM potential and possible future market penetration

The objectives of Project II will be:

- Learn WASP generation expansion planning package
- Simulate MHEW generation expansion plan with base load forecast
- Optimize MHEW generation expansion plan with modified load forecast
- Estimate the economic benefits of DSM in terms of generating energy and capacity savings
- Write report and make recommendations/policy analysis based on your results

Pre-requisites (if any): None

Hardware/Software items to be purchased/learned (if any): WASP Generation Expansion Planning Software

Final Product (if any):

[31] Project Title: Load Management by Direct Control in Industrial Sector and its Impact on Power Planning – A Case study of Central Grid of Oman

Student Specialization(s):

[ ] Communication & Signal Processing [ ] Computer Networks and Systems
[ ] Industrial Electronics & Control [2-3] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Arif Malik Sharing Ratio: 67 %
Co-supervisor: Dr. Ali Al-Maqrashi Sharing Ratio: 33 %

Rationale

The sharp increase in the cost of new generating capacity, uncertain load growth, increasing fuel prices, and other environmental and siting constraints have led to increasing interest by utilities in load management (LM) programs. LM means reducing the electric power consumption and shifting some loads from the peak hours to the off-peak ones. The economic evaluation of the LM program cost effectiveness for direct load control is summarized in the following:

1. Power system production cost savings.
2. Power system generating capacity cost savings.
3. Power system loss reduction.
4. Utility revenue lost due to low energy sales.
5. Load management equipment expenses.
6. Participating consumer's incentives.

This project will aim at developing a load management program that evaluates the potential and cost effectiveness of applying direct load control schemes in Central Grid of Oman electric power system.

Nature of the project: Planning/Simulation it has got economic and environmental component into it.	**Number of Students**: 2-3

Objectives:

The objectives of Project I will be:

- Survey of existing literature, reports and project proposals relating to load mangement in Central Grid of MHEW
- Identify gaps/new areas that need to be addressed in terms of load management
- Estimate the expenses involved in implementing direct load control schemes in Central Grid
- Estimate load management energy saving potential in industrial sector (efficient cooling and lighting, and efficient motors etc)
- Modify the load forecast of Central grid based on the estimated impact of direct load control in industrial sector

The objectives of Project II will be:

- Learn WASP/ELFIN generation expansion planning package
- Simulate MHEW generation expansion plan with base load forecast
- Optimize MHEW generation expansion plan with modified load forecast
- Estimate the economic benefits of load management in terms of generating energy and capacity savings
- Write report and make recommendations/policy analysis based on your results

Pre-requisites (if any): None

Hardware/Software items to be purchased/learned (if any): WASP/ELFIN Generation Expansion Planning Software

Final Product (if any):

[32] Project Title: Minimization of Induced Voltages on Pipelines in Close Proximity to Overhead AC Transmission Lines by Designing a Mitigation System.

Student Specialization(s):

[ ] Communication & Signal Processing [ ] Computer Networks and Systems
[ ] Industrial Electronics & Control [2-3] Power Systems and Energy

Supervisors

Principal Supervisor**:** Dr. Abdullah H. Al-Badi Sharing Ratio: 66.67 %
Co-supervisor: Dr. Ibrahim Metwally Sharing Ratio: 33.33 %

Rationale

Electromagnetic interference effects caused by electric transmission lines on neighboring metallic utilities such as water, gas and oil pipelines has become a major concern due to significant increase in the load and short circuit current levels needed to satisfy the load requirements. Another reason for increased interference levels originates from the environmental concerns, which impose on various utilities the obligation to share common corridors. Oil/Gas pipelines and overhead transmission lines (OHTLs) may share the same right-of-way (ROW) in some areas in Sultanate of Oman. This results in induced voltages on the pipeline which can be dangerous for operation personal to touch the pipeline and can cause pipeline corrosion. The study will be conducted by using state of the art software. Based on the pipeline induced voltages, mitigation techniques would be proposed, which will secure a safe working condition on the pipelines, reduce corrosion rate & minimize damage to the Cathodic Protection (CP) system.

Nature of the project (Design/Simulation): Design and Simulation | **Number of Students**: 2-3

Objectives:

The objectives of Project I will be:

- Literature survey on electrical interference between power lines and gas pipelines.
- Review of the existing techniques that are used to mitigate the induced voltage on the pipeline.
- How to use CDEGS software to analysis the electrical interference.

The objectives of Project II will be:

- Design a mitigation system to reduce the induced voltage to acceptable levels (ANSI/IEEE Standard limits) during steady-state and fault conditions for a typical case.
- Design protective measures for valve site and other aboveground pipeline appurtenances to maintain touch and step voltages within the acceptable levels.
- Effect of the mitigation system on Cathodic Protection.
- Verifying the simulation results by lab experiments.

Pre-requisites (if any):

Hardware/Software items to be purchased/learned (if any): CDEGS software

Final Product (if any): Computer Model & Experimental rig

[33] Project Title: Economic Dispatch of Power generation

Student Specialization(s):

[ ] Communication & Signal Processing [ ] Computer Networks and Systems

[ ] Industrial Electronics & Control [2-3] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Khaled Ellithy Sharing Ratio: 100%

Co-supervisor: Sharing Ratio: %

Rationale

A main objective in the operation of any of today's complex electric power system is to meet the demand for power lowest possible cost, while maintaining safe, clean standards of environmental impact. The efficient and optim economic operation of power generation systems has always occupied an important position in electric power indust In an interconnected power system, the objective is to find the real power scheduling of each power generation plant such a way as to minimize the operating cost. This means that the generator's real power is allowed to vary within cert limits so as to meet a particular load demand with minimum fuel cost. The economic dispatch of power generation is operate the power system to supply all load demands and transmission losses at minimum cost.

Nature of the project (Design/Simulation): Design & Simulation | **Number of Students**: 2

Objectives: The main objective of the project is to operate the generating units in a power plant to minimize the fuel cost.

The objectives of Project I will be:

- Characteristics of power generation Units
- Power generation control
- Operating cost & modeling of fuel cost for power generation
- Constrained parameters optimization

The objectives of Project II will be:

- Economic dispatch problem
- Economic dispatch with line losses considered
- Power flow equations and solution
- Loss formula
- Design a MTLAB program for economic dispatch problem

Pre-requisites (if any):

Hardware/Software items to be purchased/learned (if any):

Final Product (if any):

[34] Project Title: Design of a Matlab User Friendly Toolbox for Power System Voltage Stability Analysis

Student Specialization(s):

[ ] Communication & Signal Processing [ ] Computer Networks and Systems
[ ] Industrial Electronics & Control [4] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Khaled Ellithy Sharing Ratio: 50%
Co-supervisor: Dr. Adel Gastli Sharing Ratio: 50%

Rationale

The stability of an electrical power system can be classified into two broad categories, namely, transient (angular) stability and voltage stability. Traditionally the angular stability has been the focus of power system engineers. With the increased demand in electrical energy and fewer expansion plans of the power system, voltage instability has occurred more frequently and therefore, gained the attention of power system planners and operators. Power system voltage stability is referred to system ability to maintain acceptable voltage range under different system topologies and load changes. Voltage instability occurs mainly due to the fact that, unlike the active power, reactive power cannot be transported over long distances. Therefore, a power system rich in reactive power resources is less likely to experience voltage stability problems. The voltage stability assessment of a power system is of paramount importance in the planning and daily operation of electrical systems. The various methods proposed by the power system researchers provide a useful tool for voltage stability analysis. The most commonly acceptable approach to study voltage stability is power flow based methods. There are already available professional software packages that can do the voltage stability of power systems but each one of them has some limitations and weaknesses. In this project, the students will design and develop a user friendly Matlab Toolbox that overcomes the limitations and weaknesses of the professional software. The developed toolbox can be used for teaching as well as for research studies.

Nature of the project (Design/Simulation): Design & Simulation | **Number of Students**: 4

Objectives: The main objective of the project is to develop user friendly Matlab Toolbox for the study of the voltage stability of interconnected power systems.

The objectives of Project I will be:

- Power flow problem and solution
- Voltage stability problem
- Methods for voltage stability evaluation (eigenvalue analysis, P-V curve, etc)
- Voltage stability assessment
- Practice with Matlab programming tools

The objectives of Project II will be:

- Voltage stability study of a power system: practical case study
- Design a MATLAB program for voltage stability analysis
- Use EDSA software to validate results obtained with Matlab

Pre-requisites (if any): Power System Analysis II, Matlab

Hardware/Software items to be purchased/learned (if any): None

Final Product (if any): Software Package

[35] Project Title : Design and Construction of Microprocessor Relay Test Rig

Student Specialization(s):

[ ] Communication & Signal Processing [ ] Computer Networks and Systems
[ ] Industrial Electronics & Control [2-3] Power Systems and Energy

Supervisors

Principal Supervisor : Dr. Ali Al-Maqrashi Sharing Ratio : 66.67 %
Co-supervisor : Dr. Abdullah Al-Badi Sharing Ratio : 33.33 %

Rationale

The capital investment involved in a power system is so great that proper precautions must be taken to ensure that the equipment not only operates as efficient as possible but also protected from accidents.

Faults in power systems may be caused by physical accidents, weather conditions, or aging of the insulation, etc. If a fault occurs the enormous energy of the power system may cause extensive damage to equipment, severe drop in voltage and loss of lives. Hence, the power system must be protected against such faults. This is carried out by equipment known collectively as protection system.

Power System Protection plays a pivotal role in operation and functioning of a power system.

A key element in the protection system is the relay. Its operation and performance dictates the overall outcome of the protection system. Hence, great research activities throughout the world have been devoted towards developing new generation of protection relays that can perform many functions in homogeneous environment with modern computers.
Recently there have been significant developments in the design of protection relays. The early generation of relays was the electromechanical or electromagnetic type. Later the static relays were invented that use electronic components instead of the mechanical parts that constitute a major part of the electromechanical relays. Finally a new generation of protection relays has evolved. They are called microprocessor relays. They have many distinguished characteristics in comparison to the two earlier generations, the least one is their ability to communicate with computers in substations or control rooms and the possibility of integrating them easily to modern supervisory control systems.

Nature of the project : (Design/Simulation) Design and Construction	**Number of Students** : 2-3

Objectives:

The objectives of Project I will be :

- Design of circuitry of microprocessor relay test and calibration rig.
- Construction and testing of prototype version of rig.
- Initial testing of the rely using the constructed rig

The objectives of Project II will be:

- Construction of final version of the relay testing rig.
- Performing the testing and experimental activities on the rely.
- Preparing an experimental procedure for training the Protection Course students on this new relay.

Pre-requisites (if any) : Power System Analysis II (ECCE4316)

Hardware/Software items to be purchased/learned (if any): Manufacturer operating software.

Final Product (if any):

[36] Project Title: Design and Characterization of Voltage-Sag Mitigation Methods for Large High-Voltage ESP Motors

Student Specialization(s):

[ ] Communication & Signal Processing [ ] Computer Networks and Systems
[ ] Industrial Electronics & Control [2-3] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Ibrahim A. Metwally Sharing Ratio: 100%
Co-supervisor: Sharing Ratio:

Rationale

A voltage sag "dip", as defined by IEEE Standard 1159-1995, IEEE Recommended Practice for Monitoring Electric Power Quality, is a decrease in rms voltage or current at the power frequency for durations from 0.5 cycles to 1 minute, reported as the remaining voltage. Typical values are between 0.1 pu and 0.9 pu.

Voltage sag phenomenon is the most severe power quality problem that affect equipment lifetime. It can be originated from faults and starting of induction motors. Mitigation of voltage sag is one of the main challenges that utilities face in delivering "clean" power. Understanding significant characteristics of voltage sag is important before mitigation issues can be dealt with. Incorporating simulation tool in voltage sag offers the advantages in analyzing the problems efficiently and effectively. A simulation tool, Power System Computer Aided Design (PSCAD), will be used, which is a fast and reliable method to analyze the severity of voltage sag seen at distribution systems, e.g., direct on-line fed electric submersible pump (ESP) motors. For this up-to-date oil lifting system, the voltage sags affect the following: (i) process controllers and PLCs which are highly sensitive to voltage sags, (ii) ESP motor lifetime as a result of thermal and magnetic stresses, where deep sags represent the worst thermal stress case, and (iii) relays and contactors in motor starters are sensitive to voltage sags, resulting in downtime. The significance findings of the characteristics of voltage sag enable the coordination of mitigation means to address the feasibility of such application for distribution system.

Nature of the project: Design and Simulation | **Number of Students**: 2-3

Objectives:

The objectives of Project I will be:

- Literature survey on origins of voltage sag phenomenon in industrial distribution systems.
- Effects of voltage sag on equipment, especially high-voltage motors.
- Literature survey on voltage sag mitigation methods.
- Preliminary simulation of radial system of direct on-line starting ESP motor using PSCAD/EMTDC software.
- Calculation of voltage sag and comparison to IEEE Standard 1159-1995.

The objectives of Project II will be:

- Case study of one of PDO areas: comprehensive investigations of voltage sag due to different abnormalities.
- Design of different mitigation methods for ESP motors.
- Comparison between mitigation method effectiveness and applicability to ESP motors.
- Conclusions

Pre-requisites (if any): Power system transients

Hardware/Software items to be purchased/learned (if any): PSCAD/EMTDC

Final Product (if any): Computer model

[37] Project Title: Micro-controller-based applications for Control and Instrumentation

Student Specialization(s):

[ ] Communication & Signal Processing [2] Computer Networks and Systems
[**2**] Industrial Electronics & Control [0] Power Systems and Energy

Supervisors

Principal Supervisor: Farid Touati Sharing Ratio: 50 %
Co-supervisor: Faical Mnif Sharing Ratio: 50%

Rationale

Micro-controllers are those inexpensive single-chip computers, which form the core of versatile industrial applications today. The ability of micro-controllers to run programs and take decisions – perform functions – make them very attractive in pursuing optimized solutions. Nevertheless, micro-controllers are responsible for the "Intelligence" in most smart devices on the consumer market. More importantly, however, micro-controller applications always invoke disciplines like electronics, computers, and communications. This makes as such excellent capstone projects for Electrical and Computer Engineering (ECE) final-year students.

In this project, the students will realize two micro-controller-based applications: light tracker and toxic gas sensor. The two applications are, in fact, the forerunner of so many vital applications:

1. Renewable energy: solar car, decathlon projects, solar-energy based irrigation systems, etc.
2. Electronic noses: food spoilage, perfume, medicine, and law enforcement, etc.

The project, through its different phases, exposes the students to many engineering practices (e.g., technical, economical and environmental), and hence, would reinforce those concepts and give them confidence being on the offshore of the job market.

Nature of the project: (Design/Simulation) Design and implementation	**Number of Students**: 4 Preferably 0/2/2/0

Objectives:

The objectives of Project I will be:

- Learn and investigate different types of micro-controllers along with common peripherals (A/D and D/A converters, sample-and-hold circuits (SHCs), sensors, serial-to-parallel converters, quartz clocks, display units, etc.). Technical specifications and cost should be the component selection-rule
- Select required hardware components and order to purchase
- Go into deep and concentrate on studying the selected hardware components, not restrictively:
  - micro-controller hardware architecture: CPU, RAM, ROM, I/O lines, I/O serial ports, timers, A/D and D/A converters
  - micro-controller and peripheral characteristics
  - After purchase's completion: programming – learn the micro-controller language reference, write basic programs, test and troubleshoot the micro-controller.
- Write the report of Project I and design a website.

The objectives of Project II will be:

- Have the students "ready to go": get well caught up with the micro-controller programming and the various components, that to be used, in the project
- Develop and optimize a program, construct and test the whole system, and finally get it operational
- Write the report of Project II and complete the website.

Pre-requisites (if any):

Hardware/Software items to be purchased/learned (if any): Micro-controller/associated elements and components required to accomplish the project.

Final Product (if any): Micro-controller-base light tracker and toxic gas sensor on a breadboard or PCB.

[38] Project Title: Design & Construction of a Small-Scale Elevator System

Student Specialization(s):

[ ] Communication & Signal Processing [1] Computer Networks and Systems
[2] Industrial Electronics & Control [1] Power Systems and Energy

Supervisors

Principal Supervisor:	Dr Adel Gastli	(ECE)	Sharing Ratio: 50%
Co-supervisors:	Dr. Khaled El-Metwally	(ECE)	Sharing Ratio: 50%

Rationale

In this project, students are expected to design and construct a small scale elevator system for a five-floor building having the following specifications:

- The hoistway shall be about 1.2 m high with 20x20cm2 cross section.
- The car should have at least 3 stops.
- The Elevator hoistway shall be made of transparent fiber glass to allow seeing all elevator parts from outside.
- The machine room should be built on the roof.
- Doors of the elevator should be able to open at each floor similar to actual elevators.
- The car shall be able of lifting 500g.
- The speed of the car shall be 0.05m/sec.

Nature of the project: Design Simulation and Construction

Number of Students: 4

Objectives:

The objectives of Project I will be:

- Literature survey on elevator systems.
- Design a small scale elevator system.
- Modeling and Simulation of the system using Matlab/Simulink
- Animation with a SCADA Software
- Analyze all system performance.
- Select and order elevator components.
- Follow up report on Part I

The objectives of Project II will be:

- Construction of the elevator system that is controlled by a PLC.
- Test and analyze the performance of the systems.
- Comparison of Experimental results with simulation results.
- Final report (Part I & II)

Pre-requisites (if any):

- General knowledge on electronics, electric motors, Matlab/Simulink programming, PLC programming

Hardware/Software items to be purchased/learned (if any): Motor, Electronic components, Mechanical parts

Final Product (if any): Small Scale Elevator System

[39] Project Title: Design and Implementation of a Solar Car Electric System

Student Specialization(s):

[ ] Communication & Signal Processing [1] Computer Networks and Systems
[2] Industrial Electronics & Control [1] Power Systems and Energy

Supervisors

Principal Supervisor:	Dr Adel Gastli	Sharing Ratio:	70%
Co-supervisor:	Dr. Khaled El-Metwally	Sharing Ratio:	30%

Rationale

Solar Car Project has been an ongoing in the College of Engineering at SQU since fall 2002. The first generation of Solar Car has been built based on electric components mainly purchased from outside. In the second generation of the SQU Solar Car, there was an attempt to design and build Maximum Power Point Tracker (MPPT) using a PIC micro-controller that best suits the specification of the SQU car.

In applications where photovoltaic arrays are used to provide energy, maximum power trackers are used to correct for the variations in the current-voltage characteristics of the solar cells. As known, as the output potential of the string rises, the string will produce significantly less current. The current-voltage curve will move and deform depending upon temperature, illumination, and consistency of cell quality in the string. For the array to be able to put out the maximum possible amount of power, either the operating voltage or current needs to be carefully controlled. This so-called maximum power point is seldom located at the same voltage the main system is operating at, and even if the two were equal initially, the power point would quickly move as lighting conditions and temperature change. Hence, a device is needed that finds the maximum power point and converts that voltage to a voltage equal to the system voltage. The devices that perform this function are known as Maximum Power Point Trackers, also called MPPTs or trackers. Most current designs consist of three basic components: a switch-mode converter, a control and tracking section, and an auxiliary power supply.

The main goal of this project is to develop a new maximum power point tracker explicitly for use on the college of engineering solar car that are equally or more efficient compared to commercial tracker models, are more cost-effective than models produced to date, and meet solar car application-specific requirements. Other, tasks will include designing and building the whole electrical system of the Solar Car including the Solar Panels. The students are supposed to meet with the Solar Car team from the mechanical and Industrial engineering department to decide about the required specifications.

Nature of the project: Design and Construction	**Number of Students**: 4 Preferably (0-1-2-1)

Objectives:

The objectives of Project I will be:

- Literature survey on Solar Cars and MPPTs.
- Literature survey on PIC-microcontroller and Programmable Logic Controller (PLC)
- Hardware Design of the Solar Car Electric System with all protections, sensing, and metering tools
- Hardware and Software Design of a Power Maximum Power Point Tracker using a PIC microcontroller.
- Hardware and Software Design of a Maximum Power Point Tracker using a (PLC).
- Ordering of electronic components.

The objectives of Project II will be:

- Construction of the designed electronic circuits.
- Test the circuits.
- Analysis and performance evaluation in the Lab.
- Performance test on the Solar Car.
- Conclusions

Pre-requisites (if any):

- General knowledge on electronics and microprocessors

Hardware/Software items to be purchased/learned (if any): Electronic components

Final Product (if any): Maximum Power Point Tracker, Working Solar Car Electric System

[40] Project Title: Design and Realization of a Sensorless Fuzzy Logic Controlled Induction Motor Drive

Student Specialization(s):

[ ] Communication & Signal Processing [ ] Computer Networks and Systems

[2] Industrial Electronics & Control [2] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Khaled A. El-Metwally Sharing Ratio: 66.66 %

Co-supervisor: Dr. Mohamed Magdy Ahmed Sharing Ratio: 33.33 %

Rationale

AC voltage controllers are increasingly used to control the speed of three-phase induction motors, especially in low power applications with variable load torques such as fans, blowers, compressors and centrifugal pumps. Apart from providing speed control, voltage controllers may be used to achieve soft starting for large squirrel-cage induction motors. Both motor speed control and soft starting can be done by appropriate adjustment of the motor terminal voltage. However, adjusting the voltage for a given operating condition of speed and torque is not a simple task. To adjust the voltage, the firing angle of the thyristors must be calculated for each operating condition. This firing angle is a non-linear function of the motor speed and torque and it is quite difficult to find the exact value of for any motor speed and torque. Some methods of closed loop control of AC voltage regulators have been developed and applied, which requires a speed sensor.

This project proposes a sensorless Fuzzy logic based selection of the thyristors firing angles of a voltage-controlled induction motor drive. The controller operates in open loop and does not require any speed or voltage sensing. This controller is simple and has high accuracy compared to conventional mathematical calculation of the firing angle.

Nature of the project: (Design/Simulation) Design and Simulation | **Number of Students**: 4

Objectives:

The objectives of the Project Part-I will be to:

- Literature review on ac voltage regulators and Fussy logic systems. (all students)
- Digital simulation (using Matlab)of : (Students 1,2)
  1. Three-phase induction motor.
  2. AC voltage regulator with resistive load and R-L load.
  3. AC voltage regulator with an induction motor as a load.
  4. Fuzzy logic controller
  5. Fuzzy logic-Based speed control of I.M..
- Experimental work to : (Student 3,4)
  1. Build an AC regulator Circuit.
  2. Test the regulator on R-L load.
  3. Test the regulator on induction motor.
- Compare the experimental and the simulation results. (All Students)
- Follow up report on Part I

The objectives of the Project Part-II will be to:

- Investigating data accusation card and testing RTW Matlab toolbox hardware setup. (all Students)
- Implement the Fuzzy logic-Based control algorithm with the RTW Matlab toolbox. (all Students)
- Test the controller with the induction motor. (all Students)
- Comparison of simulation and experimental results. (all students)
- Final report (Part I & II)

Pre-requisites : ECCE4356

Co- requisites : ECCE4466

Hardware/Software items to be purchased/learned (if any): Matlab

Final Product (if any): Fuzzy Logic Controller of Induction Motor Drive

[41] Project Title: Design & Implementation of SCADA System for Motoring of Power Systems Lab Simulator.

Student Specialization(s):

[ ] Communication & Signal Processing [ ] Computer Networks and Systems

[2] Industrial Electronics & Control [1] Power Systems and Energy

Supervisors

Principal Supervisor: Dr. Khaled A. El-Metwally Sharing Ratio: 100 %

Co-supervisor: Sharing Ratio: %

Rationale

THE rise of computerized data acquisition, storage, and reporting systems has been driven by industry's demand for advanced troubleshooting aids and continual, measurable process and product quality improvements. Companies entering into global competition, face ever stiffer customer requirements. These requirements were especially stiff in the auto industry, where set a very high standard using statistical process control (SPC) and other world-class manufacturing methods. Industrial process motoring and control became essential requirements for such systems.

Supervisory Control and Data Acquisition (SCADA) packages provides an effective tool to remotely monitor and control

The main objective of this project is to design a SCADA motoring systems for the Power Systems Lab Simulator (PS-LS). The project involves configuring sensors, transcendences, hardware installations, wiring, PLC programming, PLC communications with SCADA, SCADA programming, system commissioning and startup.

Nature of the project: Design, Software, and Hardware

Number of Students: 3

Objectives:

The objectives of the Project Part-I will be to (all students)**:**

- Getting started to basics of PLC and SCADA systems.
  1. Implementation of different PLC programs.
  2. Starting the SCADA package and recognizing its different components.
  3. Establishing communication between the PLC and the SCADA.
- Evaluation of the current status of the Power Systems Lab Simulator
  1. Assessing current status of PS simulator contacts, transducers, and breakers.
  2. Configuring sensors/actuators required PS - SCADA system.
  3. Purchasing required sensors/actuators components.
- Follow up report on Part I

The objectives of the Project Part-II will be to (all students)**:**

- Installing required sensors/ actuators to the PS-LS
- Wiring sensors/ actuators to PLC
- PLC/ SCADA Communication setup
- Programming the PLC and the SCADA
- Commissioning Start up of SCADA Monitoring system
- Final report (Part I & II)

Pre-requisites: Digital logic design, Electronics II, Measurements

Co- requisites:

Hardware/Software items to be purchased/learned: PLC s/w, SCADA s/w, Sensors/Actuators

Final Product: SCADA Motoring System

[42] Project Title: Real Time Computer based Control of an Irrigation System

Student Specialization(s):

[ ] Communication & Signal Processing [2] Computer Networks and Systems

[**2**] Industrial Electronics & Control [ ] Power Systems and Energy

Supervisors

Principal Supervisor: Faical Mnif Sharing Ratio: 60%

Co-supervisor: Farid Touati Sharing Ratio: 40%

Rationale

In this project, we propose to design and implement a real time computer- based Irrigation System. Such system will operate automatically under given environmental conditions.

Tasks

1- Design the sensing system: This part of the project is to make the appropriate selection, calibrate and implement the sensing system. Then make the information coming from the sensor accessible from the PC.

2- Design of the actuation system. In this part student, should choose and implement the actuating system. They should use information coming from the computer to drive the valves.

3- Design of a the control strategy

Nature of the project: (Design/Simulation) Design and implementation	**Number of Students**: 4: Control/Computers: 0-2-2-0

Objectives:

The objectives of Project I will be:

- Learn and investigate different types sensors used in irrigation
- Calibrate sensors
- Select required hardware components and order to purchase
- Go into deep and concentrate on studying the selected hardware components and software, not restrictively:
  - DAQs
  - Sensors and actuators
  - Master Labview programming
- Write the report of Project I and design a website.

The objectives of Project II will be:

- Have the students "ready to go": get well caught up with the Labview programming and the various components, that to be used, in the project
- Develop and optimize the control program, construct and test the whole system, and finally get it operational
- Write the report of Project II and complete the website.

Pre-requisites (if any):

Hardware/Software items to be purchased/learned (if any): Moisture sensor, DAQ, Electric Valve,

Final Product (if any): Computer-based control System

Sultan Qaboos University
College of Engineering
Department of Electrical & Computer Engineering

SENIOR PROJECT SELECTION FORM

(Collect and return it to the Department Coordinator by **15th May, 2004**)

This form has to be completed by a group of students (2-4 students) for doing a team project. The group-students will be assigned one project by the Department on the basis of the group choices and the average group cumulative GPA.

In case of conflict between some groups, the average group cumulative GPA will be considered.

Student ID #	Student Name	Cumulative GPA

Choice Order:	Project Code Number
1st	
2nd	
3rd	
4th	