SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title:	Research Project and Report.
Code No.:	ELN 3..-3
Program:	Electronic Technology
Semester:	Six
Date:	1990 October 8
Author:	Peter Szilagyi

New: _____ Revision: _____

Approved: W Filipowich Oct 12, 1990
Coordinator Date

Approved: _____ _____
Dean Date

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GENERAL OBJECTIVES:

The Research Project and Report course is the culmination of the technical knowledge of the Electronic technology student. The technical, practical, theoretical, mathematical and english skills gained in previous semesters are applied to a program related design project of some significance.

The student is expected to display a high degree of organization and self motivation in order to complete a hardware project and a technical report, on schedule.

PREREQUISITES:

The student must be enrolled full time in the sixth semester of the Electronic Technology program or must be a previous graduate of the sixth semester, returning for the Research Project and Report course.

The following courses are particularly important prerequisites:

MTH 367-4 Calculus
ELR 309-8 Network Analysis.
ELN 305-6 Digital Communications.
ELN 318-3 Fiber Optics.
CET 315-6 Computer Interfacing.

SPECIFIC OBJECTIVES:

The student is the manager of his/her project and he/she is responsible for keeping the project on schedule and within budget. The development of the sense of this responsibility is one important objective.

The project must be challenging but not to large. A small project, completely finished, built and tested, working at the required specifications is more valuable than a large and complex one, impossible to be finished on time.
Continuous guidance from the faculty supervising the course, will assure to meet this objective.

Final advice: A pile of paper is not an acceptable substitute to a working and well documented prototype.

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PROJECT METHODOLOGY:

The instructor is the first line supervisor during the project and the customer for the finished and documented prototype.

The instructor will demand periodic progress reports, system block diagrams, flow charts, schematic diagrams and access to the students (designers) Daily Log Book.

The student shall maintain an up to date diary of project activities (Daily Log Book), including engineering design and selection notes, all calculations, sketches, schematics, specifications, assembly and test procedures.

TECHNICAL REPORT:

A type written project report, expected to be logical, factual and grammatically correct. It should contain references to current technical literature with regard to theory, procedures and tests. Suitable illustrations, photos, diagrams and tables should be included. All schematic diagrams, block diagrams and flow charts should be generated by a suitable CAD program and plotted on the plotter available in the department.

The report should be organized as follows:

- Title page and declaration of authorship.
- Table of contents.
- List of acknoledgements of sources.
- The abstract.
- The main body of the report (design, fabrication, tests, etc.)
- Appendices.
- Bibliography.

ASSESSMENT:

The student shell be assessed by letter grade on the following points:

- Project completeness.
- Technical ability.
- Organizational skills.
- Level of effort.
- Communications skills.
- Documentation and report.

Each off the above qualities must be acceptable to the instructor for the successful completion of the course. Project completeness is the most important component.

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TIMETABLE:

Week	Activity
1	Suggested projects and procedures explained.
2	Selection of project is complete.
3	Student hands in a written proposal, including the system block diagram, requirement specifications and list of major components to be ordered.
4	10 minute presentations (walkthroughs) of each project, followed by discussions.
5	Detailed block diagrams and schematic diagram sketches are produced, calculations presented.
6,7	Experimentation, measurements and tests. Schematic diagrams are finalized.
8,9	Printed Circuit Board and enclosure are designed. PCB is etched. All mechanical work on chassis, racks and enclosures is finished.
10,11	PCB is populated with parts and is tested. System is tuned to specifications.
12.13	All tests and measurements are finished, all data collected, documentation is partially edited.
14	Prototype is working at specifications, drawings plotted, technical report is edited.
15	Project is finished, working prototype and technical report is presented to the teacher.
15,16	Teacher is marking projects. X grade applications are accepted, IF JUSTIFIED.

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PROPOSED RESEARCH PROJECT TOPICS:

It is highly recommended for the student to select a project off this list. The following projects are all relevant to the course, are possible to be finished on schedule and many key components are readily available in the Department.

Other relevant projects suggested by the student may be accepted if they meet the courses standards.

Projects copied from books, magazines or former graduates, also mail order kits will directly lead to a final R .

1) THIRD METHOD (WEAVER METHOD) SSB EXCITER.

Fixed frequency sub-carrier, LSB-USB switch, 3 kHz voice bandwidth. Balanced modulators and IC filters available.

2) FM STEREO PROCESSOR FOR THE AUDIO CARRIER OUTPUT OF A SATELLITE RECEIVER.

Design and build a stereo decoder and amplifier board. Satellite equipment available in B102.

3) DOUBLE CONVERSION SHORT WAVE COMMUNICATIONS RECEIVER.

CW, LSB, USB, AM mode. Design and build a MOSFET first conversion stage, followed by a National Semiconductor LM3820 radio system IC. All semiconductor components are readily available in B102.

4) NARROWBAND FSK TRANSMITTER AND RECEIVER.

Design a Simplex 2400 Baud data link, via VHF radio, based on Motorola IC's, available in B102.

5) LOW SPEED FSK MODEM.

Design and build a working 300 Baud duplex modem, with the Motorola MC6860 modem chip, or the MC14412 and MC145440 chip set, readily available.

6) DIGITALLY CONTROLLED, 10-TH ORDER ELLIPTIC LOW PASS FILTER.

The filter cut-off frequency and pass band gain is controlled by a microprocessor trainer or an IBM PC. Op.Amp's and filter chips available.

A frequency synthesizer produces all local oscillator frequencies for an AM radio subsystem (LM3820). Dial up the radio stations from a key-pad, microprocessor trainer or computer. LM3820 radio chip and LM565 Phase Locked Loop available.

8) PROGRAMMABLE FREQUENCY SYNTHESIZER.

Generate 10 or more harmonically related frequencies with the output voltage and phase programmable. Use readily available LM565 PLL and programmable TTL counters.
10 input summing amplifier outputs digitally programmed arbitrary analog waveform.

9) HIGH IMPEDANCE RADIO FREQUENCY PROBE.

Design and build a RF probe attachment to existing Leader AC mV meters. The probe is all solid state, it outputs DC proportional with the true RMS value of the input RF. It will convert the 1 MHz Leader AC mV meter into a RF mV meter.

10) BROADBAND STEREO DIGITAL MODULATOR/DEMODULATOR.

30 Hz to 30 kHz stereo audio signal is converted to 16 bit serial digital format, for retransmission via step index optical fiber. Delta modulation or PCM could be used.
10 Mb/s fiber optic transciever is readily available.

11) FIBER OPTIC PRIVATE TELEPHONE LINK.

Use the readily available Motorola MC3518 CVSD modulator chip and the MC3419 Subscriber Loop Interface Circuit to build a 4 wire digital fiber optic telephone link.

12) DIGITAL FIBER OPTIC TV LINK WITH SOUND.

Upgrade the existing Digital Fiber Optic TV link with a 4.5 MHz sound modulator and demodulator. Set up a working audio/video link with the existing RCA industrial TV camera and the Zenith video monitor.

13) DIGITAL VIDEO MODULATOR.

Design and build a fast video sampler, (8 Mhz Nyquist rate) for the digital transmission of video signals from cameras or modular TV/Satellite tuners. Fast D/A and A/D chips must be ordered.

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14) RS232-C FIBER OPTIC MODEM.

This is a F/O transmitter and receiver, connected to the serial port of a PC. Two such modems interconnect two PC's via step index optical fiber, to allow all communications otherwise possible between serial ports. The Baud rate is 19200 Bd or lower, the distance is unlimited. All necessary components existent in the laboratory.

15) 10 LINE ELECTRONIC PABX.

Based on the available MC3416 Crosspoint Switch, design a 10 line telephone exchange with dial and ring capability.
A computer plug-in card or a microprocessor trainer controls the 10 line telephone matrix. All parts available in the lab.

16) Ku/C BAND SATELLITE SYSTEM.

Design and manufacture a 3m diameter parabolic satellite dish. It could be wire mesh or perforated aluminum. Install it on a portable platform, together with existing down-converters and Low Noise Amplifiers. Receive with the DX-500 receiver existent in the lab. This system would be used as training equipment in one of the communication courses.

17) AUTOMATED TEST EQUIPMENT.

Learn about IEEE-488 (GPIB) interfacing. Learn the ASYSTANT software package and set up a computer controlled automated test system. The following IEEE-488 interfaced instruments are available in B102:

hp 8656B	Signal Generator.
hp 8350B	Sweep Oscillator.
hp 8116A	Pulse Generator
hp 3478A	Multimeter.
hp 7475A	B size plotter.