Philadelphia University

Mechanical Engineering Department

Undergraduate Handbook

2010/2011

Contents

I. Introduction

This handbook contains important general information for students undertaking the Undergraduate Degree program in the Mechanical Engendering Department. During the academic year 2010 / 2011, this handbook will be made available on paper and on the web.

Your degree program is subject to regulations contained in the **University Student Guide**. This departmental handbook interprets the regulations and your tutors may give advice, but the University Student Guide defines the regulations.

II. Important Dates

1. Registration:

Admission criteria are issued by the Higher Education Council, which governs all private universities (80% in the Tawjihi exam). First year students must attend the University and they will be given a full timetable for the introductory activities. Departmental and University registration must be completed at the time specified in the introductory timetable (shown below). Returning students must also register in the times specified during the introductory week.

(a) The morning study (full-time students)

First year students must attend a meeting at 8.00 AM on 8th October, 2009.

2. Session Dates 2010-2011

A. FIRST TERM

- **The morning study**

  Begins: 10th October 2010

  Ends: 1st February 2011

  The first semester includes

  - Teaching, learning, and assessment activities in mechanical engineering department will run for 16 weeks, from Sunday 10th October 2010 to 1st February 2011.

- There are 3 holidays namely on 20th November , 25th December, 1st January 2011.

B. SECOND TERM

- **The morning studies**

Begin: 20th February 2011
End: 12 June 2011
The second semester includes
- Teaching, learning, and assessment activities in mechanical engineering department will run for 16 weeks, from 20th February 2011 to 12 June 2011.
- **There are 2** holidays **on, 1st May, 25th May 2010**

C. SUMMER TERM

- **The morning studies**

Begin: 26th June 2011
End: 18th August 2010
Summer semester includes teaching, learning, and assessment activities, which will run from 26th June 2011 to 18th August 2011.

- **Examination Periods**

First Semester (for morning study) - 23th January to 1st January 2011.
Second Semester (for morning study) – 1st June to 12th June, 2011.
Summer (for morning study) – Saturday 15th August to 18th August, 2011.

3. Timetable

The lecture timetable is published separately from this book. Whilst every attempt is made to schedule reasonable combinations of course units (modules), various constraints make some combinations and outside options impossible. If you have a timetable problem, please consult your personal tutor in the first instance.

III. Scope and Input Resources

1. AIMS AND OBJECTIVES

The aims and objectives of the programme are drawn from the university mission.

Mission of the Department

The Department of mechanical engineering aims to provide students with the opportunity to engage in an enjoyable and supportive learning experience which prepares them for careers in different fields of mechanical engineering and leads to a well recognized graduate qualification.

Main Aims of Teaching

The mechanical engineering program produces students who will be able to:

1. Develop the capacity to learn and practice as competent professionals and make a positive contribution to society.
2. Build self-confidence and problem solving abilities in a variety of work situations.
3. Develop awareness of the social, organizational, and professional context in which they will be working and be sensitive to cultural, moral, and political issues.
4. Contribute to and take an active part in a range of commercial, industrial, and academic activities.
5. Exhibit a broad range of skills and activities related to the mechanical and operation of typical engineering concerns.
6. Recognize the potential of emerging technologies and globalization aspects in the context of modern day mechanic practice and acquire a spirit of lifelong learning.
7. Meet and maintain standards set by professional bodies and understand the terminology, practices, tools and techniques in the operation of typical mechanical engineering.
8. Inculcate a spirit of research and enquiry through suitable mechanisms such as the Department research and staff development activities.
9. Cultivate transferable skills such as verbal and written communication, teamwork, leadership, etc.

Objectives (Learning Outcomes). The program provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas (A, B, C, and D). In the individual course unit (module) syllabus, the categories of learning outcomes (A, B, C, and D) and the individual learning outcomes appropriate to the module are identified.

A- Knowledge and understanding of:

A1) Fundamental mechanical engineering concepts derived from core subject areas such as mechanic, civil, electric.

A2) Application of established mechanics methodologies typically through different subject areas.

A3) Concepts, processes, and institutions in the provision of services which are essentially global;

A4) Issues relating to professional, ethical, social, political and environmental factors;

A5) Quality assurance, enhancement, and processes which require a suitable balance between efficiency, customer service, and stakeholder interests.

B- Intellectual skills-with the ability to:

B1) analyze a wide range of mechanical problems, provide a suitable rationale of the analysis, and provide solutions through suitable text, diagrams, quantitative illustrations, simulations etc;
B2) Perform and evaluate research with a view to acquire new knowledge and to utilize it in practice where possible;
B3) Use theoretical concepts and practical mechanical design tools to design and demonstrate typical mechanical cases;
B4) Gain a coherent understanding of mechanical theory and develop entrepreneurial skills through analysis and synthesis of large volumes of information;

C- Practical Skills-with the ability to:

C1) Plan, organizes, and operates industrial management projects ranging over a wide scale of complexity;
C2) Prepare and deliver coherent and well structured reports which meet professional standards;
C3) Utilize traditional methods and modern technology to present material and data at a professional level;
C4) Gain competence in the use of new technologies to search for and retrieve suitable materials and make discriminating use of various available resources including the Electronic Library;
C5) Communicate effectively at a spectrum of different levels and set up suitable channels of communication between various parts of an organization;
C7) Gain competence in the use of special tools which are necessary in mechanical decision making situations.

D- Transferable skills –with the ability to:

D1) Understand the importance of communication skills;
D2) Work effectively with and for others;
D3) Strike a balance between self-reliance and seeking help when necessary in new situations;
D4) Manage time, prioritize work loads, recognize and manage emotion and stress levels;
D5) Utilize information management skills e.g. use of IT, office automation and new communication technologies as they become available;
D6) Be responsive to appraisal and recognize continuous learning and training as an integral part of professional practice;

In order to provide students with the “life long learning” attitude, the teaching method is essentially based on self learning (3 hours in class rooms and 6 hours out of classrooms: coursework, practical work, workshops, seminars, etc.)

Main Aims of Research

The Department of mechnical engineering strives to formulate strategies which encourage perusal of research in order to:

1. Enrich & inform the curriculum as appropriate.
2. Improve the research output so that it is comparable to good quality examples nationally & internationally.
3. Engage staff members in scholarly activity and to allow postgraduate study where appropriate.
4. Develop a suitable post-graduate programme.
5. Enhance University investment by attracting external funds.

2. Staff

A. Academic Staff

a. Qualifications

The academic staff members all of them are full-time and divided into three categories:tutering catigory, labs supervisors and workspace techntion. The tutering staff members are 10(2 women and 8 men), while the labs supervisors staff are5 and the workspace technation staff are 2.

The academic staff members, who are between 23 and 60 years of age, have relatively different experience rang in some cases more than 25 years.

Specialisations

Teaching staff members have various specialisations that can be divided into four categories (mechanical power and energy, mechanical design, manufacturing, applied mechanics). At present.

3. Departmental Learning Resources

Code of Practice for Students of mechanical engineering:

This code of practice is supplementary to University regulations concerning the use of computing equipment which you are required to accept at Registration.

1. You must follow all rules, regulations and guidelines imposed by the Faculty of engineering and the University in addition to the Department's Code of Practice.
2. You must not use machines belonging to the Department for commercial purposes without the prior written permission of the Head of the Department. You must not sell the product of any work you do using Departmental facilities without the prior written permission of the Head of the Department.
3. You must not write or knowingly store on machines belonging to the Department software that, if executed, could hinder or annoy other users, except with the prior written permission of the Head of the Department.

a. <u>Engineering Incubator</u>

- **Student Bookshop**
  Photocopy facilities are available in the student Bookshop; Reference copies of textbooks are available at affordable prices. Copies of previous week's tutorial solutions are also available. Lending copies of textbooks are available in the University Library.
- **Printing**
  You can take printouts (free of charge) in any Department lab. Some labs contain a printer for this purpose.

- **The University Computer Centre**
  This centre provides the Department with training and maintenance facilities.

- **Networking Facilities**

  Intranet. All computing facilities of the University are connected to a Gigabit Intranet backbone.

  Internet. The University is connected to the Internet by 2 Mbps lines.
  ENG intranet 1: the PCs in the department are connected locally

Library Facilities At the University level, a mixture of learning resources is available to staff and students through a fully equipped and sophisticated library. Engineering and other learning and teaching resources, up-to-date module textbooks are available in the library with five different texts for each module. Resources are updated regularly to meet current and projected module requirements. In addition, library resources are continuously monitored to assure availability and currency.
The electronic library is also a part of the main University library.

Extracurricular Activities
The University provides recreation facilities for students to enrich their talents.
This includes:

- A Deanship of Student Affairs which organises the social, cultural and sports events at the University. It also has an alumni office to keep track of graduates
- Several spaces for cultural activities e.g. celebration of festivals, etc
- Several common rooms for meetings, snacks, and cafeterias.
- Three Internet cafes each are containing 11 PCs.
- One Student Club.

IV. Student Support and Guidance

1. Assistant Dean's Office

The Assistant Dean's Office is mainly for student advisory services. They deal also with all routine undergraduate enquiries. Problems which cannot be dealt with by the Assistant Dean will be referred to the Dean.

2. Academic Guidance

All new students should have academic (personal) tutors. The new students are grouped into groups of and each group is assigned to an academic staff member who is their academic tutor. The tutor deals with all routine undergraduate inquiries, advises for academic registration at the beginning of each semester, and any other outstanding problems. However, problems which cannot be dealt with by the tutor will be referred to the Head of the Department, the Dean of the Faculty, or to an appropriate member of academic staff. Academic guidance is available on specified dates in the terms, and any advisory service offered by the Assistant Dean is available daily to all students in the mechanical engineering Department.

The advisory service offers advice on departmental and University matters and helps with anything that concerns you, whether in your studies, in the Department, at the University or in your life outside the university. Each of the staff in these offices is available with information about the Department and university and the willingness to listen and help with whatever you bring. Note that

- All visits to the advisory service offices are strictly confidential.
- If you have difficulties with material on particular course units you should normally first approach your tutors (or lecturers/project supervisors). You may also consult with your tutors on matters that are more general but you can equally well call in at the Assistant Dean's Office.
- If you have health problems, you are welcome to consult an advisor in the Department but you may prefer to go directly to your doctor or to the University Clinic.

Feel free to make use of these services at any time.

3. Student Affairs Deanship

Confidential, individual counseling on any matter affecting personal well-being or effectiveness is available at the Philadelphia University Student Affairs Deanship. The Deanship sees well over a hundred students a year and gives expert advice on problems such as low motivation, personal decision making, relationships, anxiety and family difficulties. People who are willing to help in finding fresh ways to cope with the emotional and personal aspects of problems and seek to do so in a collaborative, straightforward and empowering way with the individual concerned. Advice is available concerning referral to other services, helping others and dealing with common student problems such as exam anxiety.

The Deanship is open from 8.00 AM to 4.00 PM, from Sunday to Thursday throughout the year and appointments can be made by calling in at the Dean of Student Affairs. All inquiries will be treated confidentially.

4. Tutoring Arrangements

Some of your course units will have tutorials, where you can discuss topics on a course unit and run through exercises. Usually, the lecturer of the course unit runs the tutorial. There will be an opportunity for you to ask questions on matters you do not understand.

As you have a personal tutor from the beginning of your University life, your tutor is there to help you on your way through University life. He/she will watch your progress and offer help and advice whenever necessary. If you get into difficulties, you should contact your personal tutor or visit the Assistant Dean at the earliest possible opportunity. Do not let things slide until it is difficult to rectify the situation, especially if you are getting behind with your work. Your personal tutor will also advise on your choice of course units, on departmental or University procedures and will provide references for jobs and other purposes.

Course lecturers are always available to discuss questions or problems with the course unit material. Each lecturer fixes at least six office hours on his timetable, which is posted on his office door. You can call in at these hours. For any reason, if these lecturers could not see you at these office hours, they may arrange an appointment at another time. It is important that any matter that affects your ability to study be reported to the Department - through your personal tutor, through the Assistant Dean or otherwise. The following are examples of matters that may affect your study: illness, personal or family difficulties (including illness in the family) or financial problems. In assessing your performance, the Department has a policy of trying to help you overcome difficulties you have encountered whilst studying. We can do this only if we are aware of the difficulties and have some idea of their extent.

5. Student Progress

Work and Attendance. The University regulations governing the Work and Attendance of students are outlined in the Student Guide 2007/2008. Full attendance is required at all lectures, laboratories, and any tutorials, which may be scheduled. Completed laboratory work should be handed in on time. Attendance at laboratories and at many lectures is monitored and attendance registers kept. Please note that students are required to undertake approximately thirty-six hours per week of study i.e. an average of two hours of private study will be required for every scheduled hour of lectures or laboratories. Some students may require much more time than this. ***Being a student is a full time occupation!*** Absence for holidays is not permitted in term-time. The experience of the Department confirms that lack of attendance leads to study problems and any student with problems should consult his/her subject tutors or personal tutor. In addition, failure to attend can result ultimately in the University barring the student from sitting for the degree examinations. The duty of the lecturer is to keep continuous review of the work and attendance of the students with whom he is concerned. If the rate of student absences, in a course unit, is greater than 15% (or 20% for student representing the University in sports or cultural activities) of the total module

hours and the student has no acceptable justification, then this student is withdrawn from that module. If the Dean of the Faculty accepts the justification of absences, then this student is considered ***withdrawn*** without refunding the course fees. A formal process is defined to tackle the problem of any student whose work and attendance appear unsatisfactory. Direct approaches by lecturers to solve the problem are as follows: He may choose to issue an "informal" warning, on a special form which may rectify the situation. If this doesn't work, a "formal" warning is issued. This is again done on another special form. Failure to remedy the situation at this stage leads to dropping the student from the module. A copy of these documents is kept in the student's file.

6. Interruption of the Degree Program

Any interruption (for a maximum of 2 years) of your degree program requires special permission from the Faculty. Regulations state that a B.A. degree is a continuous 5-year period of study. Permission will only be granted if satisfactory reasons are given. A written request with supporting evidence must be presented to the Faculty. Reasons might include prolonged illness. Consult your tutor for advice.

7. Transfer between Departments

- If you are contemplating any change of Faculty or Department, consult your primary tutor as soon as possible.
- You can change your Department by filling a special form at the beginning of the semester. The Tawjihi average required in the new Faculty or Department must be less than or equal to your Tawjihi average. A special committee will determine which courses will be accredited from your current Department.

8. Withdrawal from Modules

If you are contemplating withdrawing from a module, please discuss the situation with your personal tutor at the earliest opportunity.

- You can withdraw from a module up to the thirteenth week of the first or second term, and up to the seventh week of the summer term.
- The minimum number of credit hours (which is 9) required in each term should be followed.

V. Organization of Teaching

An individual course of lectures is known as a "**course unit**" or sometimes as a "**module**".

The curriculum contains modules that are University Requirements (Univ. Reqts.), Faculty Requirements (Faces. Reqts.), and Department Requirements (Dept. Reqts.). Each module has 3 hours per week. However, some modules are supported by

tutorials and some continuous assessment, such as seminars or laboratory work, usually amounting to 1 hour per week. When you register for course units, you should follow the academic guidance plan that the Department arranges for you. In fact, you can register any module only if you have taken its prerequisite(s) with the exception that you can register the module and its prerequisite only if you are in the graduation semester.
In each semester, you can register a minimum of 12 credit hours and a maximum of 18 credit hours, except for the semester in which you are expected to graduate when you can register 21 hours. The complete fifth - year academic guidance plan is listed in **Appendix A** of this report. For more information about module numbering and full module descriptions, see **Appendix B** of this report.

In the **First Year**, you are encouraged to take 18 credit hours each semester (first and second, the summer term is optional). The fourth digit of each course unit code (see **Appendix B**) tells you the year in which the course is offered. During each 16-week semester, students will normally complete 6 modules. Thus, each teaching week contains 18 hours or more of scheduled work. In addition, each scheduled hour typically requires two extra hours of unscheduled work (e.g. writing up lecture notes, preparing for a tutorial, finishing off a laboratory exercise etc.). The selection of a University elective module (one module) depends on your choice. Five of the first year 12 modules are University requirements, five are Faculty requirements, and two are Department requirements.

In the **Second Year,** the number and size of modules is similar to that of the first year. Three of the 12 modules of the second year are University requirements, two are Faculty requirements, and seven are Department requirements.

In the **Third Year,** you take five modules per semester. Nine modules are compulsory Department requirements. One of the compulsory modules is the **Practical Training module**, which consists of actual supervised training in an industrial organization, or using distance/online training. You should take this module in the first semester.

In the **Fourth Year,** the number and size of the modules is similar to that of the third year. In the first semester, you can select two elective modules, two compulsory modules that are Department requirements, and one free module that you can choose from any Faculty in the University. One of the compulsory modules is the Graduation Project. In the second semester, you can select two elective modules besides three compulsory modules from the Department requirements.

VI. Course Unit Choices

You may choose a course unit (module) if you have already taken all its prerequisite modules with the approval of your personal tutor.A flow diagram is available in the department that depicts the prerequisite relationships between modules.

An initial choice is made before or at Departmental Registration. After that, changes can be made as follows:

- The deadline for changing modules in each semester is one week after lectures start (three days for the summer term). Normally, no changes of modules will be permitted after these dates except for the withdrawal mentioned in point (8) of the previous section.

- In the first instance, you should discuss any plan to change modules with your personal tutor. You must check that the new module you wish to take is a valid option for your degree program and creates no schedule conflict. If there is conflict, the change is not permitted.

VII. Assessment and Examinations

1. Criteria for Assessing Examination Work

First class (90 – 100 marks). First class answers demonstrate depth of knowledge or problem solving skills, which is beyond that expected from a careful and conscientious understanding of the lecture material. Answers will show that the student

1. has a comprehensive knowledge of a topic (often beyond that covered directly in the program) with an absence of misunderstandings;
2. is able to apply critical analysis and evaluation;
3. can solve unfamiliar problems not drawn directly from lecture material and can adjust problem solving procedures as appropriate to the problem;
4. can set out reasoning and explanation in a logical, incisive and literate style.

Upper Second class (80 – 89 marks). Upper second class answers provide a clear impression of competence and show that the student

1. has a good knowledge base and understanding of all the principal subject matter in the program;
2. can solve familiar problems with ease and can make progress towards the solution of unfamiliar problems;
3. Can set out reasoning and explanation in a clear and coherent manner.

Lower Second class (70 – 79 marks). Lower second class answers will address a reasonable part of the question with reasonable competence but may be partially incomplete or incorrect. The answer will provide evidence that the student:

- has a satisfactory knowledge and understanding of the principal subject matter of the program but limited to lecture material and with some errors and omissions;
- can solve familiar problems through application of standard procedures;

- Can set out reasoning and explanation which, whilst lacking in directness and clarity of presentation can nevertheless be followed and readily understood.

Third Class (60 – 69 marks). Third class answers will demonstrate some relevant knowledge but may fail to answer the question directly and/or contain significant omissions or incorrect material. Nevertheless, the answer will provide evidence that the student

- has some basic knowledge and a limited understanding of the key aspects of the lecture material;
- Can attempt to solve familiar problems albeit inefficiently and with limited success.

Pass (50 – 59 marks). Answers in this category represent the very minimum acceptable standard. Such answers will contain very little appropriate material, major omissions and will be poorly presented lacking in any coherent argument or understanding. However the answer will suggest that the student

- has some familiarity with the general subject area;
- Whilst unable to solve problems can at least formulate a problem from information given in a sensible manner.

2. Assessment Regulations

In general, every module is assessed as follows: 50% is given for two 1-hour midterm exams, coursework and/or seminars, projects, or essays, and 50% for the final exam that may be a written exam only or a written exam plus a final laboratory exam (if applicable), final small project, or seminar presentation. The 50% for the final exam is stipulated in the University regulations. The minimum pass mark is 50% for any module, whereas the minimum passing cumulative average in each semester is 60%. Students are placed on academic probation if their cumulative average drops below 60%. In this case, students are encouraged to repeat those modules with low marks in order to increase their cumulative average. However, students will be dismissed from the University if this average is not achieved in the third attempt.

For the practical training module, each student should submit a technical report of his/her training, and a team of academic staff members makes several observations on the trainee’s work in their place of training. Then according to the observations and the report, they assess the students.

On the other hand, a committee of three staff members, including the supervisor of the project, assesses the graduation project module. The project's assessment will include the supervisor mark (35%) and the discussion committee mark (65% given as follows: 20% for project presentation, 25% for report writing, and 20% for project discussion).

3. Role of Internal and External Examiners

If many lecturers teach the same module, the main coordinator of such a module plays the role of the internal examiner of that module. All lecturers of this module propose exam questions (for the first, second and final exams). The main coordinator will collect these questions from lecturers and select some of them to include in the exam paper.

On the other hand, external examiners validate the standard of the degree program. The external examiners are expected to look at the question papers, inspect a selection of scripts and project reports (particularly the borderline ones). They supply an assessment report to the Department.

4. Appeal Procedures

If you have good reason to question a mark you have been given (in midterm exams or in coursework), you should in the first instance approach the module lecturer. If the problem is not solved, you must submit it to your primary tutor. He will find the appropriate solution within administrative structures.

Problems with final examinations are resolved by submitting complaints or appeals in writing (within three days of the announcement of examination results) to the Examination Committee of the Department. The examination committee will consider these cases and check if there is any mistake in the summation of the marks and so on.

5. Unfair Practices

The University treats attempting to cheat in examinations severely. The penalty is usually more severe than a zero in the paper concerned. More than one student of this Department was dismissed from the University because of this. Plagiarism, or copying of course or lab work, is also a serious academic offense as explained in the University guidelines.

6. Department Guidelines on Plagiarism

1. Coursework, laboratory exercises, reports and essays submitted for assessment must be your own work, except in the case of group projects where a joint effort is expected and is indicated as such.
2. Unacknowledged direct copying from the work of another person, or the close paraphrasing of somebody else's work, is called plagiarism and is a serious offence, equated with cheating in examinations. This applies to copying both from other students' work and from published sources such as books, reports or journal articles.
3. Use of quotations or data from the work of others is entirely acceptable, and is often very valuable provided that the source of the quotation or data is given. Failure to provide a source or put quotation marks around material that is quoted gives the appearance that the comments are ostensibly your own. When

quoting word-for-word from the work of another person, quotation marks or indenting (setting the quotation in from the margin) must be used and the source of the quoted material must be acknowledged.

4. Paraphrasing, when the original concept is still identifiable and has no acknowledgement, is plagiarism. A close paraphrase of another person's work must have an acknowledgement to the source. It is not acceptable for you to put together unacknowledged passages from the same or from different sources linking these together with a few words or sentences of your own and changing a few words from the original text: this is regarded as over-dependence on other sources, which is a form of plagiarism.
5. Direct quotations from an earlier piece of your own work, if not attributed, suggest that your work is original, when in fact it is not. The direct copying of one's own writings qualifies as plagiarism if the fact that the work has been or is to be presented elsewhere is not acknowledged.
6. Sources of quotations used should be listed in full in a bibliography at the end of your piece of work.
7. Plagiarism is a serious offence and will always result in imposition of a penalty. In deciding upon the penalty the Department will take into account factors such as the year of study, the extent and proportion of the work that has been plagiarized and the apparent intent of the student. The penalties that can be imposed range from a minimum of a zero mark for the work (without allowing resubmission) through warning to disciplinary measures (such as suspension or expulsion).

VIII. Teaching Quality Assurance Committee

The Departmental Teaching Quality Assurance and Enhancement Committee is responsible for the quality of teaching in the Department, including the analysis of Course Evaluation Questionnaire responses.

IX. Student Feedback and Representation

1. Staff Student Consultative Committee

Student representatives are elected onto the departmental staff student committees at the start of each term. All simultaneous sections of a module have a staff student committee. Each committee meets at least three times each semester and may discuss any matter of concern with the module. The staff members of each committee are the lecturers of the concerned sections.

2. Departmental and Deanship Meetings

The meetings held by the Head of the Department and the Dean of the Faculty during term time; mainly have an advisory role, where students may raise their problems that need some concern from these authorized persons. Separate meetings are held for students of each year.

3. Module Evaluation Questionnaires

The Department attaches great importance to the opinion of students on the quality of the teaching provided, and every student is asked to complete a Module Evaluation Questionnaire for each module. The questionnaires are anonymous.

X. Communications

1. Official Notices

Official notices are posted on the notice boards at the Department and at the Faculty. Electronic mail is also used extensively for communication with the Department and University. Each lecturer provides the students with his/her e-mail at the beginning of the term. Most official information including copies of this handbook, the undergraduate syllabus and timetables are available on the University Web pages www.philad.edu.jo. This includes directories of staff and students for internal use complete with photographs.

2. Electronic Mail

Electronic mail is used widely for administrative purposes within the Department. It is frequently useful for communicating between individuals and small groups (e.g. between a tutor and his/her tutorial group), and occasionally for broadcasting important messages to wider groups. It is important that you know how to use e-mail. It will be covered in the introductory laboratory sessions. The code of practice for computer usage covers electronic mail, Please note the points below:

3. Obscene or Offensive Mail

DO NOT SEND OBSCENE OR OFFENSIVE MAIL. If you receive mail, which you regard as offensive or obscene, you may wish to complain to a staff member so that appropriate disciplinary action can be taken against the offender.

4. Group Mailing

You are strongly discouraged from sending e-mail to groups of people. The newsgroups should be used for this purpose.

5. Miscellaneous Hints

- Be brief in your communications.
- Compose your message as if ALL of your recipients were physically present.
- Limit the distribution of messages to the people who are likely to be interested.
- Keep a copy of the mail you send out, for future reference. Learn to use folders to keep useful messages.

- Read all your incoming mail before replying to any of it. There may be other relevant messages for you to read.
- Be careful when replying to messages. You probably want your reply to go only to original message sender - not to the whole of the distribution list.
- When you reply to a message, it is frequently helpful to include some of the original message to help your recipients to remember and understand the context of the reply.

XI. Curriculum Design, Content and Organization

1. Curriculum Design and Content

The programme is offered to students from all enginerring branches that passed their Tawjihi exam with a minimum average of 80%. The programme is normally completed in five years and is offered in one mode – Day Study only, where the typical American credit hour system is applied. The Department awards the degree upon completion of 160 credit hours. The study is organised into five consecutive levels . Each level is split into two consecutive semesters (first and second) and an optional summer term. The modules are organised as follows:

37 modules Department compulsory
6 modules Department electives
12 modules Faculty requirements
8 modules University requirements

One whole module is equivalent of learning effort. The program includes one practical training module in which the student gets practical exposure to an industrial or a commercial firm.

Progression from one level of study to another requires the student to complete all prerequisites of the following year modules, and the cumulative average of grades obtained in the modules studied (whether successful or not) should be at least 60%

2. Curriculum Characteristics

Objectives of the Main University-Required Modules. These requirements are to broaden the students' basic skills: languages, computing, and culture.

Objectives of the Main Faculty-Required Modules. These requirements are to consolidate mainly the students' background in science, mathematics, computer skills.

Objectives of the Main mechanical engineering Modules in the Curriculum. The curriculum is designed so that the basic foundations of mechanical engineering are given in the first two years of study, whereas modules of the next three years allow students to acquire the essential skills for mechanical engineer development and practice.

Objectives of the Training, Special Topics and Graduation Project Modules. The objectives of these modules are to allow students to gain practice in problem analysis, design & implementation, report writing, and making presentations.

Identification of Key Stages of Progression in the Curriculum. Students are directed to take the 24 hours of university requirement modules and the 33 hours faculty requirement modules in the first two years of study. Students can also choose some modules from the list of electives.

Table (2) Compulsory and Elective Modules

A – The Compulsory Specialisation Modules	B- The Elective Specialisation Modules
1. mechanics of martial **620211 static** **620212 dynamic** **620213 strength of material**	
2. Drawing, design and machine theory. ***620121 engineering drawing*** **620221 mechanical drawing.** **620321 machine theory** **620421 design (1)** **620422 design (2)** **620424 project**	***2. Drawing, design and machine theory.*** **620525 mechanical sys design** **620521 CAD**
3. fluids and hydraulic system **620331 fluid mechanics(1)** **620431 fluid mechanics(2)** **620336 fluid mechanics lab** **620531 hydraulic systems**	***3. fluids and hydraulic system*** **620533 hydraulic power**
4.thermo dynamics and heat transfer **620341 thermo dynamics(1)** **620342 thermo dynamics (2)** **620441 heat transfer (1)** **620442 heat transfer (2)** **620446 heat transfer lab** **620541 internal combustion engine** **620543 air conditioning (1)** **620546 internal combustion lab**	***4. thermo dynamics and heat transfer*** **620544 air conditioning(2)** **620547 thermal power station** **620449 cooling systems** **620545 thermal systems design**
5. control and measurement systems **620351 engineering measurement** **620452 control** **620356 measurement lab** **620457 control lab**	
6. engineering materials and manufacturing process **620361 engineering materials properties** **620366 strength of materials lab** **620463 manufacturing process (1)**	***6.Engineering materials and manufacturing process.*** **620567 manufacturing control and plan** **620564 mould design and manufacturing** **620562 quality control** **620464 manufacturing process (2)**
7. mechanical vibration **620471 mechanical vibration**	***7. Human Resources Management*** **330371 International Business**

620476 mechanical vibration lab	**Management**
8. spatial topic in mechanic or graduate project **620591 graduate project (1)** **620599 graduate project (2)**	***8. energy and engineering management*** **620581 energy convergent** **620582 solar system** **620585 building management system** **620489 electric service in building**
9. engineering principle **620307 reversed engineering**	***9. engineering principle*** **620401 Statistics and probability**

3. Innovation in the Curriculum

The curriculum is constantly evolving to cope with new technologies and rapidly developing topics. The curriculum has been revised in 2005.

The evaluation of the module is also performed through workshops in curriculum design, typically attended by representatives from Industry and some ex-students. The Department is particularly mindful of the fast technological development and its likely effect on curriculum development. In addition, the Department policies and operations ensure that the staff appraisals are used to identify strengths and weaknesses so that appropriate action can be taken.

XII. Health and Safety at the University

The University has a Health & Safety Committee, which comprises representatives of all services within the University. It is the responsibility of this committee to investigate complaints and potential hazards, to examine the cause of all accidents and to carry out periodic inspections of all areas of the Department. At registration, you will be required to assent to the departmental code of behavior, which relates to health and safety.

1. Buildings

The Department comprises two kinds of buildings: the Rooms Building and the Laboratories.

The buildings are generally open between 08.00 and 16 (Sunday – Thursday).

In accordance with University policy, smoking is prohibited throughout all buildings.

2. Emergency Evacuation

It is the responsibility of every individual to familiarize himself with the Department's buildings and be aware of the fire exits.

- After evacuation of any building, please assemble well away from the building, and do not block any exits.
- Do not return to any building until the safety supervisor declares the emergency is over and the buildings are safe.

3. Fire Action

Fire Action notices are located at, or adjacent to, fire alarm actuation points. All staff and students should be acquainted with this routine.

4. Operating the Fire Alarm

The manual fire alarm system can be activated by breaking the glass in the red contact boxes sited at strategic points throughout the premises.

5. Use of Fire Appliances

Fire appliances are sited at strategic points throughout the Department to deal with fires. Fires should only be tackled provided there is no personal danger and after the alarm has been set off.

6. Action when the Alarm Rings

On hearing the intermittent alarm, you should prepare yourself to evacuate the building promptly.

On hearing the continuous alarm, you should evacuate the building immediately by the nearest exit.

7. Personal Difficulties

Please inform the Department's counselors or your tutor of any difficulties with which the Department can be of assistance.

3.1 First Year Modules

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Computer Engineering

Course Title:	**Engineering Work Shop (620162)**	
Prerequisite:	**none**	
Text Book:	**الاساسيات في المشاغل الهندسية**	
Providing Dept.:	**Mechanical Engineering**	
Level:	**1st year**	**Credit Hours: 1**

Course Goals:
To provide students with an integrated treatment of the work shop tools
Time Schedule:
Duration: 16 Weeks **Lectures:**
- **Objectives:**

Course Contents

	Weeks
❑ **Engineering Material Properties**	**1,2,3**
❑ **Casting Processes**	**4,5**
❑ **Metal Forming Processes**	**6,7**
❑ **Measuring and marking out**	**8,9**
❑ **Metal machining processes**	**10,11**
❑ **Joining of material**	**12,13**
❑ **Forming of non-metallic materials**	**14,15**

Mode of Assessment

Mid exam:	**(20%)**
Practical part:	**(30%)**
Final exam:	**(50%)**

References

الاساسيات في المشاغل الهندسية
الدكتور عادل محمود
جامعة العلوم والتكنولوجيا الاردنية

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Computer Engineering

Course Title:	**Engineering Work Shop (620163)**	
Prerequisite:	**none**	
Text Book:	**الاساسيات في المشاغل الهندسية**	
Providing Dept.:	**Mechanical Engineering**	
Level:	**1st year**	**Credit Hours: 1**

Course Goals:
To provide students with an integrated treatment of the work shop tools
Time Schedule:
Duration: 16 Weeks **Lectures:**
- **Objectives:**

Course Contents

	Weeks
❑ **Engineering Material Properties**	**1,2,3**
❑ **Casting Processes**	**4,5**
❑ **Metal Forming Processes**	**6,7**
❑ **Measuring and marking out**	**8,9**
❑ **Metal machining processes**	**10,11**
❑ **Joining of material**	**12,13**
❑ **Forming of non-metallic materials**	**14,15**

Mode of Assessment

Mid exam:	**(20%)**
Practical part:	**(30%)**
Final exam:	**(50%)**

References

الاساسيات في المشاغل الهندسية
الدكتور عادل محمود
جامعة العلوم والتكنولوجيا الاردنية

3.2 Second Year Modules

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Engineering Mechanics (Statics) (620211)**
Prerequisite:	(630101)
Text Book:	**Engineering mechanics, By: R. C. Hibbeler 11nd edition, Prentice Hall.**
Providing Dept.:	**Mechanical Engineering**
Level:	**2nd year** **Credit Hours: 3**

Course Goals:
The main purpose of this course is to provide the student with a clear and thorough presentation of the theory and applications of engineering mechanics.

Time Schedule:
Duration: 16 Weeks **Lectures:** 3 hours / week
Tutorial: 1 hour / week

Objectives:
At completing this module the student should be able to:
- Understand the fundamentals of statics.
- Develop Free body diagrams and procedure for Analysis.

Course Contents

	Weeks
❑ **General Principles**	**1**
❑ **Force Vectors**	**1**
❑ **Equilibrium of a Particle**	**1**
❑ **Force System Resultants**	**2**
❑ **Equilibrium of a Rigid Body**	**2**
❑ **Structural Analysis**	**2**
❑ **Internal Forces**	**2**
❑ **Center of Gravity and Centroid**	**2**
❑ **Moments of Inertia1**	**2**
❑ **Virtual Work**	**1**

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
H. works, and quizzes	**(20%)**
Final exam:	**(50%)**

References

Das, Kassimali, Sami , “Engineering Mechanics Statics”, IRWIN., 1994.

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Computer Engineering

Course Title:	**Mechanical Engineering Drawing (620221)**	
Prerequisite:	**Engineering Drawing**	
Text Book:	**Pro/Engineer software Tutorials**	
Providing Dept.:	**Mechanical Engineering**	
Level:	**3nd year**	**Credit Hours: 2**

Course Goals:
To provide students with an integrated treatment of the mechanical drawing aspects.
Time Schedule:
Duration: 16 Weeks **Lectures:** 6 hours / week

Course Contents

	Weeks
❑ **Extrusion**	**1,2**
❑ **Sketcher**	**3,4**
❑ **Revolve**	**5**
❑ **Drawings**	**6**
❑ **Blend**	**7**
❑ **Sweep**	**8**
❑ **Swept blend**	**9**
❑ **Helical sweep**	**10,11**
❑ **Sections**	**12**
❑ **Assembly**	**13,14**
❑ **Projects**	**15**

Mode of Assessment

Lab works	**(60%)**
Final exam:	**(40%)**

References

Pro/Engineer Software tutorials

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Engineering Mechanics (Dynamics) (620212)**
Prerequisite:	**Statics (620211)**
Text Book:	**Engineering Mechanics, By: R. C. Hibbeler tenth edition, Prentice Hall.**
Providing Dept.:	**Mechanical Engineering**
Level:	**2nd year** **Credit Hours: 3**

Course Goals:
Study of motion and the forces which affect motion, includes rectilinear motion, curvilinear motion, plane motion, dynamic force analysis, work and energy, impulse and momentum.

Time Schedule:
Duration: 16 Weeks **Lectures:** 3 hours / week
Tutorial: 1 hour / week

Objectives:
To help the student develop critical thinking and Problem-solving – Analyze and apply principles of engineering mechanics

Course Contents

	Weeks
❑ **Principles of Dynamics**	**1**
❑ **Kinematics of a Particle**	**3**
❑ **Kinetics of a Particle: Force and Acceleration**	**2**
❑ **Kinetics of a Particle: Work and Energy**	**2**
❑ **Kinetics of a Particle: Impulse and Momentum**	**2**
❑ **Planar Kinematics of Rigid Body: Force and Acceleration**	**2**
❑ **Planar Kinematics of Rigid Body: Work and Energy**	**2**
❑ **Planar Kinematics of Rigid Body: Impulse and Momentum**	**2**

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
H. works, and quizzes	**(20%)**
Final exam:	**(50%)**

References

- Engineering Mechanics. (Dynamics) J. L. Meriam

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title: Solid Mechanics (620213)
Prerequisite: Static (620211)
Text Book: Mechanics of Materials, 3rd Ed. By Beer & Johnston. International edition, McGraw.Hill, Inc.1992
Providing Dept.: Mechanical Engineering
Level: 2nd year Credit Hours: 3
.

Course Goals:
Studying the Theory of Machine is very important for continuing advance made in the design of Machine and Structures.
Time Schedule:
Duration: 16 Weeks **Lectures:** 3 hours / week, 1hour tutorial
Objectives:
At completing this subject the student should be able to:
- Treatment of the three basic ideas of equilibrium, deformation, and material behavior properties.
- These three ideas are emphasized and kept in focus and careful study of how their combination leads to specific theories about the transmission of forces in typical structural members.

Course Contents

Weeks

- **Introduction, concept of stress (1) [1,5,8,9,33,35]---------- {1 }**
- **Stress and strain (2A) [34,37,38,45]----------{1}**
- **Material behaviors (2B) [121,126,129,8,82,87]----------{1}**
- **Torsion, circular solid and hollow shafts. (3) [13,18,30,38,45,75]----------{2}**
- **Pure bending loads.(4) [3,8,10,199] ---------- {2}**
- **Beam, shaft, shear and bending moments diagrams. (5) [18,25,32]------{1}**
- **Shearing stresses (6) [3,4,21] ……--…{1}**
- **Transformation of stress and Strain (Mohr's circle). (7A) [5,14,29,51]---.{1}**
- **Thin-wall pressure cylinder. (7B) [99,104,109]----------{1}**
- **Stresses under combined loading. (8) [32,41,49,50] …… ----..{1}**
- **Deflection of beams, by integration.(9A) [4,21,24,43]----------{1}**
- **Deflection of beams, by moment area method.(9B) [100,121, 138]--------{1}**
- **Buckling (Columns). (10) [13,17,35,36]----------{1}**
- **Energy Methods. (11)-[5,19,39]----------{1}**

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
H. works, and quizzes	**(20%)**
Final exam:	**(50%)**

References

Strength of Materials. By: Alexander, 1991.
Applied strength of materials. By: Moot, Robert L., 2002
Strength of Materials. By: Ryder 1989.
Mechanics of Materials. By:Gere & Timoshenko, 1990

3.3 Third Year Modules

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Theory of Machines (620321)**
Prerequisite:	**Dynamics (620212)**
Text Book:	**Design of Machinery third ed., By: Robert L. Norton. McGRAW – HILL**
Providing Dept.:	**Mechanical Engineering**
Level:	**3rd year** **Credit Hours: 3**

Course Goals:
Studying the Theory of Machine is very important for continuing advance made in the design of instrumentations, automatic controls.
Time Schedule:
Duration: 16 Weeks **Lectures:** 3 hours / week
Objectives:
At completing this subject the student should be able to:
- Dealings with the Mechanisms of the Machine elements which is concerned with the Kinematics of linkages, Cams, Gears and Gear trains.
- Other analysis of the Machine parameters have been useful in the design of machine elements.

Course Contents

	Weeks
❑ **INTRODUCTION (General dynamics)**	**1**
❑ **Linkages**	**2**
❑ **Velocity and acceleration diagrams**	**3**
❑ **Cams**	**2**
❑ **Crank efforts and Flywheel size.**	**2**
❑ **Balancing. (rotating and reciprocating masses) .**	**2**
❑ **Gearing and gear trains.**	**1**
❑ **Planetary gear trains.**	**1**

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
H. works, and quizzes	**(20%)**
Final exam:	**(50%)**

References

Mechanics of Machines , By: Hannah and Stephens.
Theory of Machines and Mechanisms , By: Shigley and Uicker.
Mechanics of Machines , By: Khurmi and Gupta.

PHILADELPHIA UNIVERSITY

FACULTY OF ENGINEERING

Department of Mechanical Engineering

Course Title: Fluid Mechanics I (620331)
Prerequisite: (630201),(620212)
Text Book: Introduction to Fluid Mechanics, R. Fox and Alan McDonalds, Willy.
Providing Dept. Mechanical Engineering
Level: 4th year Credit Hours: 3

Course Goals:
To introduce the students to the physical concepts of Fluid Mechanics and its analysis methods
Time Schedule:
Duration: 16 Weeks Lectures: 3 hours / week
Objectives:
At completing this course the student should be able to:

- **Solve fluid statics problems,**
- **Solve Fluid mechanics problems using Control Volume Analysis,**
- **Formulate Fluid mechanics problems using differential Analysis,**
- **Apply Bernoulli equation,**
- **Use dimensional analysis,**
- **Calculate head losses in pipes**

Course Contents

	Weeks
❑ **Fluids and their properties**	**1**
❑ **Fluid statics.**	**2**
❑ **Conservation Equations in Integral form for a control volume**	**3**
❑ **Introduction to differential analysis of fluid motion; Continuity equation Momentum equation.**	**3**
❑ **Incompressible invicid flow; Euler's equation, Bernoulli equation**	**3**
❑ **Dimensional Analysis and similarity.**	**1**
❑ **Flow in pipes and ducts**	**2**
❑ **Introduction to boundary layers**	**1**

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
H. works, and quizzes	**(20%)**
Final exam:	**(50%)**

References

Fundamentals of fluid mechanics, Munson, Yong, and Okishi, Willy
Engineering Fluid Mechanics, Crowe and Roberson, Willy.
Fundamentals of fluid mechanics Gehart,Gross, and Hochstein, Adison Wesley.

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Computer Engineering

Course Title:	**Fluid Lab (620336)**	
Prerequisite:	**Fluid Dynamics**	
Text Book:	**Fluid lab Manual**	
Providing Dept.:	**Mechanical Engineering**	
Level:	**4th year**	**Credit Hours: 1**

Course Goals:
To provide students with an integrated treatment of the analysis of traditional fluid dynamics processes and experiments.

Time Schedule:
Duration: 13 Weeks **Lab session:** 3 hours / week

Experiments

	Weeks
❑ **Density**	**2**
❑ **Viscosity**	**3**
❑ **Center of pressure on submerged plan surface**	**4**
❑ **Impact of water jet**	**5**
❑ **Fluid meter in incompressible flow**	**6**
❑ **Pipe flow**	**7**
❑ **Pressure distribution about circular cylinder**	**8**
❑ **Drag force determination**	**9**
❑ **Analysis of air foil experiment**	**10**
❑ **Open channel flow- Sluice gate**	**11**
❑ **Open channel flow- Over a weir**	**12**
❑ **Tank measurements**	**13**

Mode of Assessment

Lab works	**(60%)**
Final exam:	**(40%)**

References

Fluid Dynamics books

PHILADELPHIA UNIVERSITY

FACULTY OF ENGINEERING

Department of Mechanical Engineering

Course Title: Thermodynamics I(620341)
Prerequisite: Engineering Mathematics (2) (630102)
Text Book Thermodynamics An Engineering Approach, Yunus Cengel and M. Boles, McGraw Hill, 4rd Edition, 2002.
Providing Dept. Mechanical Engineering
Level: 3rd year Credit Hours: 3

Course Goals:

This course is designed for third year engineering students. It introduces them to the first law and second law of thermodynamics and their applications in engineering problems.

Time Schedule:
Duration: 16 Weeks Lectures: 3 hours / week

Objectives:
At completing this course the student should be able to:

- **Identify basic concepts of thermodynamics such as work, heat, energy, control volume, closed and open systems, etc….**
- **Evaluate the properties of pure substances.**
- **Estimate the energy transfer by heat, work and mass.**
- **Apply the first law of thermodynamics on different systems and for different applications.**
- **Understand the concept of entropy.**
- **Apply the second law of thermodynamics on different systems and for different applications.**

Course Contents	*Weeks*
✓ Basic Concepts of Thermodynamics	1
✓ Properties and behavior of pure substances	2
✓ Energy Transfer by Heat, Work and Mass	2
✓ First law of Thermodynamics	3
✓ Second law of Thermodynamics	2
✓ Entropy	3

Mode of Assessment

First exam:	(15%)
Second exam:	(15%)
H. works, and quizzes	(20%)
Final exam:	(50%)

References

- **Fundamentals of Engineering Thermodynamics, M. Moran and H. Shapiro, 3rd Edition, Wiley and Sons, New York, 1998.**

Course Title	:	**Reverse Engineering**	640580
Class Time	:	11.15 – 12.45 Mon / Wed	Room 312
Prerequisite	:		
Text Book	:	Class Notes will be available for students before each module	
Credit Hours	:	3 **Level** 3	

Course Goals:

To the students Reverse Engineering Methodolgy

Time Schedule:

Duration: 16 Weeks **Lectures:** 3 hours / week

Tutorial: **Laboratories:**

Objectives: After the completion of this course, students should be able to

1- Design engineering systems using engineering design steps
2- Differentiate between design and re-design
3- Re-design of mechanical systems
4- Re-design of computer systems
5- Re-design communication systems
6- Re-design electrical systems
7- Re-design mechatronic systems

Course Contents

Week	Contents	Instructor
1	Introduction to reverse engineering	Dr. Tarek Tutunji
2-4	Mechanical systems	Dr. Ali Othman
5-7	Computer systems	Engr. Salah Badran
8-10	Communication & Electronic systems	Engr. Ibrahim Abu Isbeih
11-13	Electrical systems	Engr. Abdullah Alomoush
14-15	Mechatronic systems	Dr. Tarek Tutunji

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
H. works, and quizzes	**(20%)**
Final exam:	**(50%)**

References

1 Product Design: Techniques in Reverse Engineering and New Product Development by K. Otto and K. Wood

Prentice Hall, 2000

2 The Mechanical Design Process by Ullman, D.G. McGraw-Hill, New York, 1992

3 Reverse Engineering by Ingle, K. McGraw-Hill, NY, 1994

4 Reverse Engineeeing by Wills, Linda Newcomb, and Philip. Kluwer Academic Publishers, 1995

5 Engineering Design: A Systematic Approach by G. Pahl and W. Beitz. Springer Verlag, 1996

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Thermodynamics 2 (620341)**
Text Book:	**Thermodynamics, an Engineering approach. By Y.Cengel, 5th edition.**
Providing Dept.:	**Mechanical Engineering**
Level:	**3rd year** **Credit Hours: 3**

Course Goals:
To have a good understanding of all power cycles.

Time Schedule:
Duration: 16 Weeks **Lectures:** 3 hours / week
Tutorial: 0 hour / week **Laboratories**: 0 hours / week

Objectives:
- Verify the second law and all types of cycles.
- To know when and how to use these laws in the practical life.

Course Contents

	Weeks
• Exergy	2
• Gas power cycles	3
• Vapor and combined power cycles	3
• Refrigeration cycles	2
• Gas mixtures	2
• Gas and vapor mixture (Air conditioning)	2

Mode of Assessment

First exam	(15%)
Second exam	(15%)
Hw's and quizzes	(20%)
Final exam	(50%)

References

1. Fundamentals of Engineering thermodynamics, Moran and Shapiro 1998.

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Instrumentations and Measurements (640364)** **Engineering Measurements (620351)**
Text Book:	**Experimental Methods for Engineers, by: J.P. Holman, 7th ed.**
Providing Dept.:	**Mechanical Engineering**
Level:	**3rd year**

Course Goals:
To introduce the students with basic knowledge of experimental methods and measurement techniques.

Time Schedule:
Duration: 16 Weeks **Lectures:** 3 hours / week
Tutorial: 0 hour / week **Laboratories**: 0 hours / week

Objectives:
At completing this course the student should be able to:

- Understand the fundamental concepts of measurements technique.
- Understand the basics of uncertainty and statistical analysis
- Apply the basics of experimental data analysis.
- Understand the basics of electrical measurements and electrical devices
- Use measurements devices of temperature, pressure, flow, force, and strain.

Course Contents

	Weeks
• Introduction	1
• Basic concepts	2
• Analysis of experiments data	3
• Basic electrical measurements and sensing devices	3
• Pressure measurements	2
• Flow measurements	2
• Temperature measurement	2
• Force and strain measurements	1

Mode of Assessment

First exam	(15%)
Second exam	(15%)
Hw's and quizzes	(10%)
Small project	(5%)
Creativity	(5%)
Final exam	(50%)

References

1. Northrop, R. B., "Introduction to Instrumentation and measurements," CRC Press, Boca Raton, FL, 1997.
2. Doebelin, E. O., "Measurement Systems: Analysis and Design," 4th ed., McGrrw-Hill, NY, 1990.

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Engineering Materials Properties (620361)**
Text Book:	**Materials Science and Engineering: An Introduction, by: W. D. Callister, 6th ed.**
Providing Dept.:	**Mechanical Engineering**
Level:	**3rd year** **Credit Hours: 3**

Course Goals:
To introduce the students with the fundamentals of: Metal structures and crystallization, plastic deformation, material failure, alloys, phase diagrams, iron-iron carbide equilibrium diagrams, and heat treatment of materials.

Time Schedule:
Duration: 16 Weeks
Tutorial: 0 hour / week
Lectures: 3 hours / week
Laboratories: 0 hours / week

Objectives:
At completing this course the student should:

- Identify the basic classifications, bonding, and structures of the most industrially important materials.
- Recognize the materials strengthening processes.
- Know the materials failure mechanisms.
- Distinguish between main steel types.

Course Contents

	Weeks
• Introduction	1
• Atomic structure and bonding	2
• Crystalline structure	2
• Dislocations and plastic deformation	3
• Material failure	2
• Phase diagrams	2
• Iron and steel	2
• Glasses and polymers	2

Mode of Assessment

First exam	**(15%)**
Second exam	**(15%)**
Hw's and quizzes	**(20%)**
Final exam	**(50%)**

References

2. W. F. Smith, and J. Hashemi, 2006, "Fundamentals of Materials Science and Engineering", 4th ed., McGraw Hill, Boston.
3. V. B. John, 1992, "Introduction to Engineering Materials", 3rd ed., ELBS.

Philadelphia University
Faculty of Engineering
Mechanical Engineering Department

Course Outline

Course Name : *strength and properties of materials Lab (***620366***)*

Week	***Experiment***
(1)	**Introduction**
(2)	**Tensile Test**
(3)	**Fatigue Test**
(4)	**Application of Mechanical Load Cell**
(5)	**Shear Test**
(6)	**Impact Test**
(7)	**Creep Test**
(8)	**Hardness Test**
(9)	**Compression Test**
(10)	**Examination of Material Microstructure.**
(11)	**Torsion Test**

Pre – request

- Properties of Engineering Materials

Grading

1. 60% Lab work (quizzes and in lab reports) :
   1. 20 Marks on the first four experiments
   2. 20Marks on the second four experiments
   3. 5 Marks on the last two experiments
   4. 10 Marks on quizzes
   5. 5 Marks on term project

2. 40% final Exam:

3.4 Fourth Year Modules

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Machine Design I (620421)**
Prerequisite:	**Solid Mechanics (620213), Theory of M/C (620321)**
Text Book:	**Shigley and Mischke (2003) Mechanical Engineering Design, 7th Edition, McGraw Hill**
Providing Dept.:	**Mechanical Engineering**
Level:	**4th year** **Credit Hours: 3**

Course Goals:
Introduction to design process, Design considerations, Stress analysis in machine elements and deflection, failure of machine elements, Fatigue, Power screws and threaded fasteners, Welded joints and riveted joints, Mechanical springs.

Time Schedule:
Duration: 16 Weeks **Lectures:** 3 hours / week
Tutorial: 1 hour / week

Objectives:
The Students should be able to go through the design process and consideration cycle. Perform stress and deflection analysis of machine elements. Apply the different theories of failure on the design processes. Determine the fatigue life or safe fatigue load on the elements. Design and analysis of some machine elements and processes such as: power screw and bolts, welding and riveting connections. Design of helical springs.

Course Contents

	Weeks
❑ Introduction to mechanical engineering design, **Ch.(1, 2,3)[2-29,30,32,3-6,7,9]**	2
❑ Stress analysis**, (4) [4d,8d,13,23c,25d,55,74]**	3
❑ Deflection analysis,(Singularity and super position) (5**) [24,36,41]**	2
❑ Theories of failure, **(6)[1,7b,7d,22]**	2
❑ Design for fatigue strength**, (7)[8,13,26]**	3
❑ Bolts, screws and rivets., **(8)[1,6,9,15]**	2
❑ Welded connections, **(9)[11,12]**	1
❑ Design of mechanical springs, **(10) [3,19]**	1

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
Reports, H. works, and/or Projects	**(20%)**
Final exam:	**(50%)**

References

Machine Elements in Mechanical Design, 3rd Edition, By Robert L. Mott.
Fundamental of machine components design, By Juvinall.

PHILADELPHIA UNIVERSITY

FACULTY OF ENGINEERING

Department of Mechanical Engineering

Course Title:	**Heat Transfer I (620441)**
Prerequisite:	**Fluid Mechanics (1) (620331), Thermodynamics (1) (620341)**
Text Book:	**Fundamentals of Heat and Mass Transfer,P. Incropera & Dewitt, Wiley, 5th Edition**
Providing Dept.:	**Mechanical Engineering**
Level:	**4th year** **Credit Hours: 3**

Course Goals:

To learn the student the basic concepts of heat and mass transfer

Time Schedule:

Duration: 08Weeks **Lectures:** 3 hours / week

Tutorial: 0 hour / week **Laboratories**: 0 hours / week

Objectives:

At completing this course the student should be able to understand the:

- Introduction to heat transfer modes and energy balance.
- One and two -Dimensional conduction
- Heat transfer in extended surfaces-Fins.
- Transient conduction
- Introduction to convection process

Course Contents

	Week
• **Introduction to Heat Transfer (Modes, Energy and Analysis**	**1**
• **Introduction to conduction: conduction rate equation, thermal conductivity, heat diffusion, equation, and boundary and initial conditions**	**1**
• **One-dimensional steady-state equation: plane wall, radial system, and conduction with heat generation, application of thermal resistance, and heat transfer from external surfaces**	**1**
• **Tow-dimensional steady-state conduction, method of separation variables, graphical method, finite differences equations, and solution.**	**1**
• **Transient conduction: One-dimensional unsteady state heat conduction: Mathematical approach, lumped capacitance method**	**2**
• **Introduction to convection: convection boundary layer, laminar and turbulent flow convection transfer equation, velocity and thermal boundary layer 1 similarity.**	

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
Reports, H. works, and/or Projects	**(20%)**
Final exam:	**(50%)**

References

1. Heat Transfer, J.P. Holman, S.I. Metric edition, Mc-Graw Hill, Latest Edition.

2. Heat Transfer, Martin Becker, Plenum Press, Latest Edition.

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Automatic Control (620452)**
Prerequisite:	**Measurement (620351) + Vibrations (620471)**
Text Book:	**Automatic Control System, Benjamin Kuo, Eighth Edition, John Wiley &Sons, Inc.**
Providing Dept.:	**Mechanical Engineering**
Level:	**4th year** **Credit Hours: 3**

Course Goals:
Analyzing and understanding control systems
Time Schedule:
Duration: 16 Weeks **Lectures:** 3 hours / week
Objectives:
The objective of this course is to apply knowledge of mathematics and engineering to analyze and design a control system to meet desired specifications. Students should learn to analytically determine a control system's functionality and select appropriate tests to demonstrate system's performance and finally design a control system to meet a set of requirements.

Course Contents

	Weeks
• Introduction to Control Systems and Mathematical Foundation	1
• Linearization and Block Diagrams	1
• Mathematical Modeling of Systems	2
• Time Domain Analysis: 1st Order Systems	1
• Time Domain Analysis: 2nd Order Systems and Model Reduction	1
• Steady-State Error Analysis and Routh Hurwitz Stability Criterion	2
• Root Locus Technique	3
• Frequency Domain Representation of LTI Systems	2
• Frequency Domain Analysis: Nyquist Criterion	1
• Design of Control Systems: Lead Compensators	1
• Design of Control Systems: Lag Compensators	1

Mode of Assessment

- **First exam: (15%)**
- **Second exam: (15%)**
- **H. works, and quizzes (20%)**
- **Final exam: (50%)**

References

- Feedback Control of Dynamic Systems by Gene F. Franklin, J. David Powell and Abbas Emami-Naeini, 4th Edition, Prentice Hall, 2002.
- Modern Control Engineering by Katsuhiko Ogata, 4th Edition, Prentice Hall, 2002.

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Measurements Lab.**	**(640367) Prerequisite: Sensors and Actuators (640364)**
Providing Dept.:	**Mechanical Engineering**	
Level:	**3rd year**	**Credit Hours: 1 Semester**:

Course Goals:
To introduce the practical side of actuators and sensors, also helping to understand how that device can be used.

Time Schedule:
Duration: 14 Weeks **Sessions:** 3 hour / week

Course Contents

	Weeks
❑ **INTRODUCTION TO MEASUREMENTS**	**1**
❑ **NOISE MEASUREMENT**	**1**
❑ **CALIBRATION OF A PRESSURE GAUGE**	**1**
❑ **PRESSURE TRANSDUCERS**	**1**
❑ **LIQUID LEVEL MEASUREMENT**	**1**
❑ **THE WHEATSTONE BRIDGE**	**1**
❑ **THE OPERATIONAL AMPLIFIER**	**1**
❑ **CALIBRATION AND TESTING OF THERMOCOUPLES**	**1**
❑ **STRAIN GAUGES**	**1**

Mode of Assessment

1. **Lab Works** **(60%)**
2. **Final Exam** **(40%)**

References

1. Beckwith T.G., Marangoni R.D., "Mechanical Measurements", Addison – Wesley, 5th Edition, 1993.
2. Sawhney A.K., Sawhney P., "A Course in Electrical & Electronic Measurements and Instrumentation", Dhanpat Rai, 11th Edition, 1995.

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title : Automatic Control Lab (620457)
Text Book :Automatic Control Systems , Benjamin C KUO , 7th edition , Willy

Course Content

NO	Experiment Title	Weeks No
1	Level Sensor	1
2	Characteristics of pump and motor of pump	2
3	ON –OFF control of the level	3
4	Closed Loop proportional – integral –derivative control of the level	4
5	Closed loop proportional control of flow sensor	5
6	ON –OFF control of the temperature	7
7	Pressure sensor as level sensor	8
8	Introduction to OP-AMP	9
9	Position Control system	10

Mode of Assessment

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Mechanical Vibrations**	**(620471)**
Prerequisite:	**Dynamics**	**(630212)**
	Advanced Engineering Analysis	**(650304)**
Text Book:	**Mechanical Vibrations, By: S. S. Rao**	**4th ed., Pearson, Prentice Hall.**
Providing Dept.:	**Mechanical Engineering**	
Level:	**4th year**	**Credit Hours: 3**

Course Goals:

The main purpose of this course is to provide the student with a clear and thorough knowledge of the theory and applications of Mechanical Vibrations for different mechanical systems, in addition to the properties of oscillatory motion, derivation of governing differential equations, harmonically exited motion, rotating and reciprocating unbalance, support motion, vibration measurements, vibration isolation, transient vibrations.

Time Schedule:

Duration: 16 Weeks **Lectures:** 2 hours / week

Tutorial: 1 hour / week

Objectives:

At completing this module the student should be able to:

Model and solve mass-spring-damper problems, and calculate dynamic response of the free vibration of single degree of freedom systems.

Model and solve harmonically exited single degree of freedom systems.

Model a system with rotating unbalance.

Comprehend the vibration measurement and isolation techniques.

Model and solve multi-degree of freedom and continuous system problems.

Course Contents

	Weeks
❑ **Fundamentals of Vibrations. (ch. 1)**	**3**
❑ **Free Vibration of single degree of freedom systems. (ch. 2)**	**3**
❑ **Harmonically exited vibration. (ch. 3)**	**2**
❑ **Two degrees of freedom systems. (ch. 5)**	**3**
❑ **Vibration control. (ch. 9)**	**3**
❑ **Exam**	**1**

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
H. works, reports, and/or projects	**(15%)**
Final exam:	**(50%)**

References

Vierck, 'Vibrationanalysis' 2nd ed. (1979), Harper and Row.

Engineering Vibration Analysis with Application to Control Systems, By:

C. F. Beards BSc, PhD, C Eng, MRAeS, MIOA

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Outline

Course Name : Vibration Lab (620476)

№	*Experiment*
(0)	**Introduction and review of vibration basics**
(1)	**Mass – Spring system**
(2)	**Pendulum (Simple and Compound)**
(3)	**Bifilar Suspension**
(4)	**Forced Vibration with negligible damping**
(5)	**Transverse Vibrations of a Beam**
(6)	**Fly Wheel system**
(7)	***Centre of Percussion & Kater's (Reversible) Pendulum***
(8)	**Whirling of Shaft Machine**
(9)	**Static and Dynamic Balancing**
(10)	**Mass – Spring – Damper system**

Pre – request

- Mechanical Vibration
- Measurement Lab

Grading

3. 50% Lab work (quizzes and in lab reports) :
   i. 15 Marks on the first set experiments
   ii. 15 Marks on the second set experiments
   iii. 5 Marks on the last set experiments
   iv. 10 Marks on quizzes
   v. 5 Marks on term project
4. 50% final Exam:

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title: Machine Design II (620422)
Prerequisite: Machine Design I (620421)
Text Book: Shigley and Mischke (2003) Mechanical Engineering Design, 7th Edition, McGraw Hill
Providing Dept.: Mechanical Engineering
Level: 4th year **Credit Hours: 3**

Course Goals:
Design and selection of basic machine elements specially: shafting, Rolling element Bearings, Journal Bearings, Gearing, Brakes, Clutches and Coupling, Flexible mechanical elements.

Time Schedule:
Duration: 16 Weeks **Lectures:** 3 hours / week

Objectives:
The Students should be able to perform detailed design and selection of power transmission shafts, then select and specify mounting details of different types of bearings. Design hydrodynamic journal bearings. Select and specify gear parameters for specific power transmission requirements, and perform kinematics analysis and synthesis of gear trains. Design and / or select different types of clutches, brakes and flexible power transmission elements.

Course Contents

	Weeks
❑ Review of related materials	**1**
❑ Rolling element bearings, **(Ch.11) [2,6,12]**	**2**
❑ Journal bearings, **(Ch.12) [2,7]**	**1**
❑ Gearings, **(Ch.13,14,15) [13-6,28,14-9,13,24,15-3]**	**6**
❑ Clutches, brakes and couplings, **(Ch.16) [2,7,16]**	**2**
❑ Flexible power transmission elements, **(Ch.17) [2,19,26]**	**2**
❑ Power transmission shafts, **(Ch.18) [5,7,10]**	**2**

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
Reports, H. works, and/or Projects	**(20%)**
Final exam:	**(50%)**

References

1. Machine Elements in Mechanical Design, 3rd Edition, By Robert L. Mott.
2. Fundamental of machine components design, By Juvinall.

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Heat Transfer II**	**(620442)**
Prerequisite:	**Heat Transfer I**	**(620441)**
Text Book:	**Fundamentals of Heat and Mass Transfer,P. Incropera & Dewitt, Wiley, 5th Edition**	
Level:	**4th year, Class No. 212**	**Credit Hours: 3**

Course Goals:
To learn the student how to design thermal systems
Time Schedule:
Duration: 16 Weeks **Lectures: 3 hours / week**
Tutorial: 0 hour / week **Laboratories: 0 hours / week**
Objectives:
At completing this course the student should be able to understand the :
- **Thermal design of heat exchanger.**
- **Principles of thermal radiation.**
- **Convection process.**
- **Internal and external flow.**

Course Contents

	Week
• **Introduction to Convection.**	**1**
• **External Flow.**	**2**
• **Internal Flow.**	**2**
• **Free Convection.**	**2**
• **Heat Exchangers.**	**3**
• **Radiation - Processes and Properties.**	**3**

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
Reports, H. works, and/or Projects	**(20%)**
Final exam:	**(50%)**

References

1. Heat Transfer, J.P. Holman, S.I. Metric edition, Mc-Graw Hill, Latest Edition.
2. Heat Transfer, Martin Becker, Plenum Press, Latest Edition.

Philadelphia University
Faculty of Engineering
Mechanical Engineering Department

Course Name : Heat Transfer Lab.
Course №: 640446

№	Experiment
(1)	Marcet Boiler
(2)	Thermal conductivity
(3)	Natural convection and radiation
(4)	Forced Convection Heat Transfer
(5)	Bomb calorimeter
(6)	Film and Drop-wise Condensation
(7)	Heat Exchanger I (parallel and counter flow)
(8)	Heat Exchanger II (effect of flow rate variation)
(9)	Air Conditioner (heat pump and air cooler)

Pre -request

- Heat tansfer
- Fluid Mechanics Lab.

Grading

- **60 % Lab Works**
- **40% Final Exam**

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Production Processes (620461), Manufacturing Processes (620463)**
Text Book:	**Manufacturing Methods for Engineering Materials, by: S. Kalpakjian, 4th ed.**
Providing Dept.:	**Mechanical Engineering**
Level:	**4th year** **Credit Hours: 3**

Course Goals:
To introduce the students with the fundamentals of manufacturing processes

Time Schedule:
Duration: 16 Weeks **Lectures:** 3 hours / week
Tutorial: 0 hour / week **Laboratories**: 0 hours / week

Objectives:
At completing this course the student should be able to:

- Classify the different manufacturing processes.
- Understand the main types of materials' mechanical behavior.
- Understand the following basic manufacturing processes: casting, bulk deformation, material removal, and joining processes.
- Select, analyze, and design basic manufacturing processes for product development.

Course Contents

	Weeks
• Introduction	1
• Fundamentals of mechanical behavior of materials	3
• Solidification processes	2
• Bulk deformation processes	6
• Material removal processes	3
• Joining processes	1

Mode of Assessment

First exam	(15%)
Second exam	(15%)
Hw's and quizzes	(10%)
Project	(10%)
Final exam	(50%)

References

1. E. D. DeGramo, J. T. Black, and R. A. Kohser, 1997, "Materials and Processes for Manufacturing", Prentice Hall, Upper Saddle River, New Jersey.
2. M. P. Groover, 1996, “Fundamentals of Modern Manufacturing", Prentice Hall, Upper Saddle River, New Jersey.

3.4 Fifth Year Modules

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Hydraulic Machines (620531)**	
Prerequisite:	**Fluid Mechanics I (620331)**	
Text Book:	**Collected materials from several text books**	
Providing Dept.:	**Mechanical Engineering**	
Level:	**5th year**	**Credit Hours: 3**

Course Goals:
To learn the student the design and the design and the operation of turbo machines
Time Schedule:
Duration: 16 Weeks **Lectures:** 3 hours / week
Tutorial: 0 hour / week **Laboratories**: 0 hours / week
Objectives:
At completing this course the student should be able to understand the:

- The jet theory
- The construction of turbo machines
- The hydrodynamic design
- The system matching
- Types of machines

Course Contents

	Week
General theory of machinery.	**1**
Jets theory.	**1**
Impulse and reaction pressure turbine. (Kaplan, Pelton Francis turbines)	**5**
Introduction of hydrodynamic pumps. (Centrifugal-radial, Axial, mixed flow pumps)	**3**
Application of Similarity to hydrodynamic machines	**2**
Hydraulic machines Design.	**1**
Positive displacement pumps. (Gear, Lobe, van pumps...etc.)	**2**
Pipelines networks.	**2**

Mode of Assessment

- **First exam: (15%)**
- **Second exam: (15%)**
- **Reports, H. works, and/or Projects (20%)**
- **Final exam: (50%)**

References

- **Hydraulic & compressible flow turbomachines, A.T.Sayers,McGraw Hill 1990**
- **Pump Handbook, Igor Karassik, Mc Graw Hill 1986**

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title: Air Conditioning and Refrigerating (1) (620543)
Prerequisite: Thermodynamics (2) (620342) + Heat Transfer I (620441)
Text Book: Principles of Heating, Ventilating and Air Conditioning, R. Howell et al., ASHRAE, 1998
Providing Dept.: Mechanical Engineering
Level: 5th year Credit Hours: 3

Course Goals:
To learn the student how to design the air conditioning and refrigerating systems
Time Schedule:
Duration: 16 Weeks **Lectures:** 3 hours / week
Tutorial: 0 hour / week **Laboratories**: 0 hours / week
Objectives:
At completing this course the student should be able to:
- Determine the comfort conditions in different applications.
- Estimate the heating and cooling loads for the required design.
- Design the water and air distribution systems.
- Select the appropriate air conditioning system components such as pumps, fans, furnaces, boilers, etc….

Course Contents

	Week
• **Introduction to Air Conditioning Systems.**	**1**
• **Psychrometry, Conditioning Processes and Comfort Conditions.**	**3**
• **Heat Transfer in Buildings.**	**1**
• **Heating Load Calculation.**	**2**
• **Cooling Load Calculation.**	**2**
• **Energy Calculations.**	**1**
• **Flow, Pumps, and Piping Design.**	**3**
• **Underfloor Heating**	**1**

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
Reports, H. works, and/or Projects	**(20%)**
Final exam:	**(50%)**

References

1. Heating and Air Conditioning, M. Alsaad and M. Hammad, Third Edition, Amman, Jordan, 2001.
2. Heating and Cooling of Buildings, J. Kreider, P. Curtiss and A. Rabi, Second Edition, McGrawHill, 2002.

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Internal Combustion Engines I**	**(620541)**
Prerequisite:	**620842**	
Text Book:	**Engineering Fundamentals of the Internal Combustion Engine, By W. W. Pulkrabek**	
Providing Dept.:	**Mechanical Engineering**	
Level:	**5st year**	**Credit Hours: 3**

Course Goals:
Provides the material needed for the basic understanding of the operation of the internal combustion engines.
Time Schedule:
Duration: 7 Weeks **Lectures:** 6 hours / week
Objectives:
At completing this module the student should be able to:
- Recognize the basic types of internal combustion engines.
- Estimate the performance of internal combustion engines
- Know the fundamental thermochemistry as applied to fuels.
- Follow the various operational processes from intake to exhaust.
- Be familiar with cooling and lubrication systems.

Course Contents

	Weeks
❑ Introduction to Internal Combustion Engines	0.5
❑ Engine Design and Operating Parameters	1
❑ Air-Standard Cycles	1
❑ Thermochemistry and Fuels	1
❑ Fuel Motion Within Combustion Chamber	0.5
❑ Combustion in SI and CI Engines	1
❑ Exhaust Flow	0.5
❑ Air Pollution	0.5
❑ Engine Cooling and Lubrication	1

Mode of Assessment

First exam:	**(15%)**
Second exam:	**(15%)**
Reports, H. works, and/or Projects	**(20%)**
Final exam:	**(50%)**

References

1. Internal Combustion Fundamentals, By John B. Heywood
2. Internal Combustion Engine in Theory and Practice, By P. L. Ballaney
3. Internal Combustion Engines and Air Pollution, By F. D. Obert
4. Internal Combustion Engines, By V. Ganesan, 10th ed.

PHILADELPHIA UNIVERSITY
FACULTY OF ENGINEERING
Department of Mechanical Engineering

Course Title:	**Internal Combustion Engines Lab.**	**(620546) Prerequisite: Internal Combustion Engines (620541)**
Providing Dept.:	**Mechanical Engineering**	
Level:	**5th year**	**Credit Hours: 1**

Course Goals:
To introduce the practical side of Internal Combustion Engines.

Time Schedule:
Duration: 14 Weeks **Sessions:** 3 hours / week

Course Contents

	Weeks
❑ **INTRODUCTION TO INTERNAL COMBUSTION ENGINES**	**1**
❑ **MORSE TEST**	**1**
❑ **WILLAN'S LINES TEST**	**1**
❑ **FULL LOAD PERFORMANCE**	**1**
❑ **HEAT BALANCE**	**1**
❑ **SPARK IGNITION ENGINE – IGNITION LOOP**	**1**
❑ **SPARK IGNITION ENGINE – MIXTURE LOOP**	**1**
❑ **ENGINE BREATHING – HALF LOAD PERFORMANCE**	**1**
❑ **CO ANALYZER**	**1**
❑ **Flash and Fire Points**	**1**

Mode of Assessment

1. **Lab works** **(60%)**
2. **Final Exam** **(40%)**

References

3. Willard W. Pulkrabek, "Engineering Fundamentals of the Internal Combustion Engine", Prentice Hall, 1997.