HOPE UNIVERSITY COLLEGE

FACULTY OF SCIENCE & TECHNOLOGY

DEPARTMENT OF INDUSTRIAL TECHNOLOGY

(DRAFT CURRICULUM)

MARCH 2010

1.0 INTRODUCTION

Ethiopia is one of the least developed nations in industrial development. Agriculture and particularly traditional agriculture is the mainstay of many citizens in Ethiopia. Agricultural development at the present scale cannot contribute much towards national economic development. It is only through industrial development that we can come out of the myriad of economic problems that beset us at the moment.

The various university level engineering courses of the country are designed to educate engineers to fit in the different application areas of engineering. Usually these engineers require additional time to cope with the industrial environment because their academic exposure to hands-on work is limited. On the other hand, Technical and Vocational Training (TVET) programs of the country are designed to train skilled manpower for industries, usually in narrow or focused skills.

Therefore neither the university level Engineering education nor the TVET training is able to produce highly skilled, flexible and broad based, practically oriented manpower. Yet the demand for such people is growing day by day in rapidly emerging small and medium-scale industries.

This demand calls for establishing higher institutions that promote knowledge *and* skill in industrial development. Hope University College (HUC) aspires to start with a center of excellence in industrial technology, among others. Industrial technology students learn how things work, how they are made, and how to make them better. The curriculum of the Bachelor of Science in Industrial Technology integrates technical courses with courses in general education, quantitative sciences, natural science, and business management. The B.Sc. degree program in Industrial Technology prepares graduates for employment in technical and/or management positions as productivity improvers, usually in manufacturing. Graduates are problem solvers, able to identify an opportunity for improvement and make it happen. These improvements may be in the areas of efficiency, productivity, production flow, product / process quality, cost reduction or safety.

At least half of all class time is made up of hands-on application lab activities. Students will also have experience in business. This has proven to be a powerful combination that quickly makes graduates valuable members of an organization, as well as providing a sound foundation for advancement. Typical starting job titles include Manufacturing Engineer, Quality Engineer, Project Engineer, Application/Sales Engineer and Production Manager. Many graduates advance into corporate positions such as plant managers, department and division mangers, and corporate leaders.

2.0 VISION, MISSION, AIM, AND OBJECTIVES

2.1 Vision Statement

The vision of the Department of Industrial Technology of HUC is to be the nation's premier department preparing graduates to excel in industrial technology programs.

2.2 Mission Statement

The mission of the Department of Industrial Technology of Hope University College is to provide high-class, integrated curricula to its students which are relevant to their lives and careers, valuable in terms of content and competencies, and connected to the needs of business and industry.

2.3 Aim

The Bachelor of Science in Industrial Technology program is geared toward preparing graduates for careers in applying modern technology to the design and manufacturing of products, consumer goods and services. It also prepares students for a broad range of technical and managerial positions within business, industry and government.

2.4 Objectives

The overall objective of the Industrial Technology program at HUC is to educate broad based technical and/or management oriented professionals for employment in business, industry, education and government.

The specific objectives of the industrial technology program are to:

- prepare graduates to become technical generalists in industrial technology;
- meet the need for personnel with a cross-disciplinary understanding of manufacturing, information technology, and business practices;
- provide awareness of the usefulness of applying computer and automation technology to enhance the efficient management and overall productivity of manufacturing organizations;
- prepare graduates for entry-level employment in several functional areas including: manufacturing, process research and development, manufacturing engineering, production planning and control, materials testing, quality control, production supervision, inventory control and industrial engineering.
- prepare students to engage in management positions in business, industry, and government;
- prepare students to work in a team with members of various disciplines.

3.0 GRADUATE AND PROGRAM PROFILE

All HUC graduates shall exhibit the following general Competencies:

Personal Accountability for the student's actions, at work and in society at large.

Self-regulation*:* reflecting critically on the professional work of the student, and adjusting to finish tasks successfully.

Intellectuality: working scientifically, using analytical skills, to develop and carry out research valuable to the country's needs and development, writing and presenting the results in a clear and coherent manner; and valuing continual self-development through lifetime learning to cope with an environment of continuous change and a rapidly evolving society.

Leadership: able to lead people in the right direction by combining humility and respect for all people with integrity, strategy, motivating skills, a strong work ethic and an attitude of service; also able to serve as a leader in local, and national arenas.

3.1 Professional Profile

Industrial production managers plan, direct, and coordinate the production activities required to produce products, and they ensure that production proceeds smoothly and stays within budget. Therefore Industrial technology graduates are hands-on problem solvers. They fill a critical need in business and industry as supervisors and managers who possess a combination of technical and managerial backgrounds.

3.2 Program Profile

The Industrial Technology program is a highly flexible program which prepares graduates for technical managerial positions in industry by building upon prior technical course work. Through a balance of technical theory, hands-on application, and solid management courses, students are prepared to solve industrial problems.

Industrial technology is primarily involved with the management, operation, and maintenance of complex technological systems while engineering and engineering technology are primarily involved with the design, installation and operation of these systems.

Therefore graduates with a B.Sc. in Industrial Technology from Hope University College will have knowledge from a wide range of manufacturing and management courses which will enable them to work in the business, industry and government sectors. Having also obtained hands-on technical knowledge, they could engage in their own or other private entrepreneurship. After four years of training in the field of Industrial Technology the students will have:
knowledge and understanding of:

- general education in communication skills, physics, economics, civics and leadership
- industrial technology, engineering graphics, manufacturing materials and computer-aided manufacturing, hydraulics and pneumatics, metal machining,
- fabricating and casting, industrial instrumentation and controls, computer methods in industrial technology.

Major Practical Skills in:

- applications of engineering graphics,
- computer aided manufacturing,
- product manufacturing,
- production tooling,
- manufacturing database applications.

Transferable skills

- Students will develop transferable skills in the areas mentioned above by spending enough time at the workshop, testing and experimenting, working in a team, and exercising communication skills.

4.0 TEACHING METHODS & PHILOSOPHY

4.1 Teaching Methods

The teaching methods involve class room lectures, laboratory activities, field work and excursions. Students will also engage in seminar presentation, project execution and involvement in community work. Special attention will be given to integrating knowledge and professional skills so that the graduates are prepared for leadership in their fields.

4.2 Teaching Philosophy

Based on the mission of HUC and the outcomes of the interviews with relevant stakeholders, the following elements are in the curriculum:

- Excellence in applying scientific knowledge in a professional setting
- Continual interaction between faculty, students and professional learning environments
- Integration of theory and practice with the purpose to become excellent professionals
- Participation from stakeholders to create a challenging and practical curriculum
- Competencies as an important outcome of the curriculum
- Integration of teaching and coaching with a focus on talent development of the student.

Graduates of HUC will make a difference through a balance of the following elements

- **Knowledge & skills**
  Their professional activities are based on knowledge and skills that will help to contribute to the professional setting in which they are working.
- **Values & vision**.
  Their professional activities should be based on integrity and a strong conviction about major issues in professional activities.
- **Personality & professionalism**
  The student's professional activities are based on a balance of self knowledge from reflection on the one hand and eagerness to function in a professional way on the other.

Stressing these three elements underlines the importance of a holistic approach using a competency based curriculum. This modern concept of competency stresses the interrelationship of several learning dimensions in which the students combine knowledge, skills, motivation and attitude to create effective learning processes and to meet the standardsoft Hope University College.

The educational program will be characterized by increasing complexity. Knowledge, skills, attitude and comptences will be tested at several levels during all years. The following five complexity-dimensions are distinguished:

- level of self management of the student
- level of professional cases to be dealt with
- the level of knowledge (and required analytical skills) to understand a specific subject
- the number of instruments, tools and methods needed to approach the subject

The department acknowledges these dimensions and challenges the students in their process towards professional maturity. Therefore, the curriculum has the integrative elements between theory and practice, between the different disciplines that are taught (a multi-disciplinary approach), and between the constituting parts of a competency. Furthermore, the curriculum has integrative elements between linguistic, calculative, analytic, synthetic, technical and ethical/philosophical

tools to explore available knowledge and develop a moral and intellectual maturity for better judgement, leadership and knowledge ability.

5. ASSESSMENT METHODS

- Written examinations: mid-term and final exams, quizzes.
- Practical Exams: seminars, writing papers, skill demonstrations, oral presentations, evaluation of laboratory/workshop and internships.

6. ADMISSION REQUIREMENT

After a successful completion of the preparatory program:

- As per the regulations of Ministry of Education,
- As per the senate legislation of the University, or
- A pass in entrance examination set by the department

7. DURATION OF THE STUDY

The duration of study for a B.Sc. in Industrial Technology is four years.

8. DEGREE NOMENCLATURE

The degree offered after successful completion of the program is called:

- In English – "Bachelor of Science Degree in Industrial Technology'
- In Amharic –"

9. GRADUATION REQUIREMENT

Graduating students shall be awarded the "Bachelor of Science Degree in Industrial Technology' if they fulfill the following requirements:

- A minimum credit hours of 142
- A minimum Cumulative Grade Point Average of 2:00
- A minimum Cumulative Grade Point Average of 2:00 in core courses
- No F, NG, I, in any course and
- Compliance with the regulation of the University

10. COURSE CODING

Course Codes have a four-letter prefix and a three-digit number.

- The prefix which represents the department, is assigned to all core courses in the department. If a core course is the responsibility of another department, it will be assigned a new number in the current department, but both codes will be shown on the course description to indicate that they actually are the same.

- The first digit represents the year in which the course is offered by the responsible department (year at college starts with 2).
- The second digit distinguishes the course from other core courses offered in that semester.
- The third digit indicates the semester in which the responsible department offers the course to its students.

11. QUALITY ASSURANCE

The quality of the program offered by the department is assessed by the performance of its graduates and the impact they bear on the industrial sector of the country. The quality assurance methods adopted by the department include the following:

- in line with the HUC, student evaluations regarding the teaching-learning process are taken at the end of each semester.
- feedback from employers and stakeholders is obtained through personal contacts formally and/or informally;
- regular formative evaluations and a summative evaluations after four years should be done.

12. GRADING SYSTEM

The grading system is a five scale grading system ranging from A to F and the respective grade points are presented below.

Grade	A^+	A	A^-	B^+	B	B^-	C^+	C	C^-	D^+	D	D^-	F
Value	4.00	4.00	3.75	3.50	3.00	2.75	2.50	2.00	1.75	1.50	1.00	0.75	0.00

13. LIMITATIONS OF THE CURRICULUM

The curriculum has the following limitations:

- Traditionally in Ethiopia, students and organizations are more familiar with a 5-year engineering program and are little aware of a degree program in technology fields. The new program (Industrial Technology) of HUC is a four year program with a summer internship. It does not embrace all engineering courses because the purpose is different. This may for some time be contested until people become fully aware that such programs are useful and are practiced in other parts of the world.

- Because of restrictions in credit hours, traditional courses may be missing. HUC has chosen the most important courses to meet its purposes, removing overlapping and near graduate level courses.

14. RESOURCE REQUIREMENTS

14.1 Teaching staff

The quality of the education to be provided is very dependent on the skill and excellence of its staff members. Therefore, the HUC Senate has placed great emphasis on this aspect. As a result, some volunteer expatriate staff will provide quality teaching in areas where there is a deficiency. Moreover, HUC is in the process of recruiting qualified local staff with M.Sc. degrees and above, who possess good credentials and appropriate experience.

14.2 Library and Computer facilities

Students will have access to one of the best libraries in the country. The spacious, state-of-the-art library will have relevant, recent books, E-books and other materials to use for their studies, reserve shelves for staff and student use, and books for personal interest and development. Computers will be available in the library as well in computer labs and pools, giving students access to Internet information needed for research papers and documentation of sources.

14.3 Laboratory facilities

Hope Enterprises possesses one of the best workshops in the country with facilities that are useful for electrical, industrial, manufacturing, and civil engineering purposes. The facilities have so far been used for diploma students but with the launching of the University College the facilities will be used for the college students as well. HUC plans to have its own facilities on campus within a short period of time.

14.4 Recreational and sporting facilities

HUC will provide students opportunities to have recreation and leisure during their free time. There is a state of the art auditorium where students can attend dramas, public debates, or speeches by renowned figures. They will also enjoy indoor and outdoor games in the facilities and grounds. HUC's motto is to develop students of good character and stature.

15. CLASS SIZE

To assure the continuous assessment policy, the optimal class size shall be:

- For courses with student discussion – up to 40
- For lecture type courses – 80 students per class
- For lab and skill based courses – 24-30 students per class

16. PROGRAM STRUCTURE

Industrial Technology is a discipline associated with implementing, operating, and continuously improving systems of machines, materials and processes, and making good use of financial, human and energy resources. This curriculum emphasizes integrating technological management knowledge with leadership skills, to help manufacturing/processing industries achieve desired goals of efficiently, with appropriate concern for the environment, ethics, quality and human diversity.

16.1 Rationale for Curriculum

The proposed program is designed to fill the gap between the highly theoretical engineering training at the university level and the lower level technical and vocational education at TVET colleges. The training emphasizes applications of basic engineering and technological knowledge to solve industrial problems. Therefore, the courses are linked with workshop and laboratory exercises. The salient features of the proposed industrial technology program include the following:

- Leadership, entrepreneurial and businesses management courses are included to train the future leaders of the industry and enhance the self-initiative of the trainees to start new businesses.
- The program is designed to prepare graduates for immediate responsibilities with no or very limited apprenticeship.
- The courses provide needed background to solve practical industrial problems in the country.
- The program is designed to fill the gap by supplementing the hands-on experience of the trainees with in-depth theoretical understanding by balancing theoretical and practical training.
- The training incorporates independent thematic studies, and seminars to encourage student centered learning.

16.2 Structure of the Curriculum

The Industrial Technology program is designed to be completed within eight semesters. Each semester shall have 16 weeks of regular classes. Additionally there shall be an internship program after the third year for two and a half months, where students have a chance to work on practical industrial problems. This real world experience will help the students link theory and practice and have a vision of the skill, discipline and ethics as demanded by industrial work.

The curriculum has a unique modular structure. Here are very brief descriptions of the modules covered by students during their four years at HUC. A complete course list for each module is listed in Section 17: Course List, and a more complete explanation of each module and the Internship is found in the Appendix at the end of Course Descriptions.

16.2.1 Core Engineering Science Module

This module aims to enable students to understand the fundamentals of engineering science concepts and phenomena, industrial control, and relationships of solid mechanics, thermo-fluids and materials including their limitations and application.

16.2.2 Focus area Modules

The focus area modules include industrial engineering and management, manufacturing engineering and technology, and mechanical design modules. An Internship after the third year puts the skills and knowledge learning into practice: manufacturing/developing products, improving management.

16.2.3 Support Module: Basic Science, General Engineering and Business

This module aims to transfer knowledge of mathematics, electrical engineering, and business management skills essential in the field of industrial technology.

16.2.4 Foundation Module: communication, humanities, economics, computers

This module develops knowledge and skill in communication, computers, leadership, teamwork, economics and civic and ethical responsibilities.

17. LIST OF COURSES FOR INDUSTRIAL TECHNOLOGY

Table 1: List of Core Engineering Courses

Module	Code	CORE ENGINEERING SCIENCES Course Title	Cr. Hr	Lec. Hr	Lab. Hr
General	INDT 221	Technical Drawing with Sketching	2	1	3
	INDT 222	Computer Aided Machine Drawing	2	1	3
	INDT 312	Advanced Computer-Aided Drafting	3	1	4
		Total Credits	**7**		
Thermal	INDT 332	Fluid Mechanics	3	3	-
Engineering	INDT 431	Fundamentals of Thermodynamics	3	3	-
Science		Total Credits	**6**		
	INDT 212	Engineering Mechanics	3	2	2
Applied	INDT 451	Mechanisms of Machinery	3	2	2
Mechanics	INDT 342	Strength of Materials	3	2	2
		Total Credits	**9**		
Materials	INDT 311	Engineering Materials I	3	3	-
Science	INDT 322	Engineering Materials II	3	3	-
		Total Credits	**6**		
Industrial	INDT 412	Industrial Automation and Control	3	2	2
Control		Total Credits	**3**		
		Grand Total for Core Engineering Module	**31**		

Table 2. List of Focus Area Module Courses

Focus Area Module	Code	Course Title	Cr. Hrs	Lec. Hrs	Lab. Hrs.
Mechanical	INDT 421	Design of Machine Elements I	3	2	2
Design	INDT 422	Design of Machine Elements II	3	2	2
	INDT 551	Product design and development	3	2	2
		Mechanical Design module Total Credits	**9**		
Manufacturing	INDT 211	Introduction to Industrial Processes and Measurement	3	2	2
Engineering &	INDT 232	Workshop Technology	2	1	4
Technology	INDT 331	Machining Technology	3	1	4
	INDT 512	Computer Aided Manufacturing	3	2	2
	INDT 341	Welding Technology	3	1	4
	INDT 321	Foundry Technology	3	2	2
	INDT 411	Metal Forming Technology	3	2	2
	INDT 432	Polymer and Composite Manufacture	2	2	-
	INDT 452	Tool and Die Design and Manufacture	3	2	2
	INDT 522	Process Planning and Costing	2	2	-
		Manufacturing Engr & Technology Total Credits	**27**		
Industrial	INDT 531	Industrial Equipment Maintenance	3	2	2
Engineering &	INDT 532	Industrial Quality Management	3	3	-
Management	INDT 441	Industrial Safety and management	3	3	-
	INDT 541	Industrial Project Management	3	3	-
	INDT 442	Production Planning and Control	3	2	2
	INDT 521	Facility Planning & Plant Design	3	2	2
	INDT 511	Appropriate Technology Transfer	2	2	-
	INDT 542	Senior Research Project	3		
Internship	INDT 462	**Internship**	3	0	2.5 mos.
		Industrial Eng. Management Total Credits	**26**		.
		Total Focus Area Module Credits	**62**		

Table 3: List of Supportive Courses

Focus Area Module	Code	Support courses: Course Titles	Cr. Hrs	Lec. Hrs	Lab. Hrs.
Basic Science,	MATH 205	Applied Mathematics I	4	3	2
General Engr.,	MATH 206	Applied Mathematics II	4	3	2
Business	STAT 301	Introduction to Probability and Statistics	3	3	-
Management	ENGN 312	Basic Electricity and Electronics	3	2	2
	ENGN 322	Electrical Machines and Drives	3	3	-
	PHYS 202	Physics Laboratory	3	2	2
	MAEN 212	Introduction to Business Management	3	3	-
	MAEN 211	Introduction to Entrepreneurship	3	2	2
		Grand Total	**26**		

Table 4: List of Foundation Courses

Focus Area Module	Code	Foundation: Course Titles	Cr. Hrs	Lec. Hrs	Lab. Hrs.
Communication	CEED 201	Civic and Ethical Education	3	3	-
Civics and	COMP 201	Introduction to Computer Applications	3	2	2
Leadership	LEAD 501	Leadership Skills	3	3	-
Computer	ECON 202	Introduction to Economics	3	3	-
Skills and	PSYC 201	General Psychology	3	3	-
Economics	FLEN 201	Sophomore English	3	3	1
	FLEN 202	Professional Writing	3	3	1
	FLEN 301	Communication and Presentation Skills	3	3	1
		Grand Total	**24**		

Table 5: Summary table indicating the proportion of credit hours in Industrial Technology

Course Category	Total Credit Hr.
Major Compulsory Courses: Core Engineering Focus Areas	31 62
Supportive	26
Foundation	24
Grand Total	**143**

17.3 COURSE OFFERINGS (*Sequencing courses by semester*)

Table 6: presents course offerings by semester of the four-year undergraduate degree program in industrial technology of HUC.

SEMESTER I

Code No	Course Title	Cr
MATH 205	Applied Mathematics I	4
CEED 201	Civics and Ethical Education	3
INDT 211	Introduction to Industrial Processes and Measurement	3
COMP 201	Introduction to Computer Applications	3
FLEN 201	Sophomore English	3
INDT 221	Technical Drawing with Sketching	2
	Total	**18**

SEMESTER II

Code No	Course Title	Cr
MATH 206	Applied Mathematics II	4
INDT 212	Engineering Mechanics	3
INDT 222	Computer Aided Machine Drawing	2
PHYS 202	Physics Lab	3
FLEN 202	Professional Writing	3
INDT 232	Workshop Technology	2
	Total	**17**

SEMESTER III

Code No	Course Title	Cr
FLEN 301	Communication & Presentation Skills	3
INDT 311	Engineering Materials I	3
INDT 321	Foundry Technology	3
STAT 301	Introduction to Probability and Statistics	3
INDT 331	Machining Technology	3
INDT 341	Welding Technology	3
	Total	**18**

SEMESTER IV

Code No	Course Title	Cr
ENGN 312	Basic Electricity and Electronics	3
INDT 312	Advanced Computer Aided Drafting	3
ENGN 322	Electrical Machines and Drives	3
INDT 322	Engineering Materials II	3
INDT 332	Fluid Mechanics	3
INDT 342	Strength of Materials	3
	Total	**18**

SEMESTER V

Code No	Course Title	Cr
INDT 411	Metal Forming Technology	3
INDT 421	Design of Machine Elements I	3
INDT 431	Fundamentals of Thermodynamics	3
PSYC 201	General Psychology	3
INDT 441	Industrial Safety Management	3
INDT 451	Mechanisms of Machinery	3
	Total	**18**

SEMESTER VI

Code No	Course Title	Cr
INDT 422	Design of Machine Elements II	3
INDT 412	Industrial Automation and Control	3
MAEN 211	Introduction to Entrepreneurship	3
INDT 432	Polymer and Composite Manufacture	2
INDT 442	Production Planning & Control	3
INDT 452	Tool and Die Design and Manufacture	3
	Total	**17**

IMTE 462 **Internship** **3** **Summer**

SEMESTER VII

Code N	Course Title	Cr
INDT 511	Appropriate Technology Transfer	2
INDT 521	Facility planning and Plant Design	3
INDT 531	Industrial Equipment Maintenance	3
INDT 541	Industrial Project Management	3
ECON 202	Introduction to Economics	3
INDT 551	Product Design and Development	3
	Total	**17**

SEMESTER VIII

Code No	Course Title	Cr
INDT 512	Computer Aided Manufacturing	3
MAEN 212	Introduction to Business Management	**3**
LEAD 501	Leadership skills	**3**
INDT 522	Process planning and product costing	**2**
INDT 532	Industrial Quality Management	**3**
INDT 542	Senior Research Project	**3**
	Total	**17**
	Grand Total	**143**

COURSE DESCRIPTIONS FOR CORE ENGINEERING COURSES

COURSE TITLE: **TECHNICAL DRAWING WITH SKETCHING**
COURSE NUMBER: **INDT 221 SAME AS BCTE 221**
CREDIT HOUR: **2**
PREREQUISITE: **NONE**

Course Description

This course on technical drawing with sketching allows the student to learn the techniques of drawing while gaining skills in sketching that are useful in communicating visually. The student will learn the technical language of drawing by using the standard international conventions of drawing that bridge the gap between a drawing and reality. The student applies what is learned through sketching as a preparation for future work on computer aided drawing.

Course Objectives
At the end of the course, students would be able to:

- understand the different types of projection techniques
- understand technical drawing terms and techniques
- apply standard symbols
- use conventional dimensioning technique
- read existing drawings
- sketch auxiliary and sectional views as a supplement of multi – view drawings.
- draw simple objects using a CAD systems

Textbooks

1. Besterfield, D. 2006. Technical Sketching with an Introduction to AutoCAD (4^{th} ed.). 464 p. ISBN-10 012432781.
2. Giesecke, F. E., Alva Mitchell, H. C. Spencer, et al. 2008. Technical Drawing (13^{th} edition). Prince Hall. ISBN-10: 0135135273. 912 pages.

References

1. Simmons amd Maguire, Manual of Engineering Drawing, 2^{nd} edition, 2002, Elsevier Newness
2. David Madsen, Introduction to Engineering drawing and Design, 3^{rd} edition, 2001, Delmar Cengage Learning; 3 edition ISBN-10: 0766816346
3. Brian Griffths, Engineering Drawing for Manufacture, Elsevier Science, 2003

Assessment/Evaluation

Assignments and Class work	60%,
Final Examination	40%.

COURSE TITLE: **COMPUTER-AIDED MACHINE DRAWING**
COURSE NUMBER: **INDT 222**
CREDIT HOUR: **2**
PREREQUISITE: **TECHNICAL DRAWING WITH SKETCHING**

Course Description

The course covers types of machine drawings that require representation of fasteners, bearings, seals, gears, welded connections, fits and tolerance and surface texture. Drafting exercises use simple units such as check valves, workshop jacks, vises, hand pumps, hand grinders or hand drills.

Course Objectives

At the end of the course, students should be able to

- read and prepare simple machine drawings using a CAD system,
- correctly dimension views,
- describe fits and tolerances, surface texture and geometric tolerances,
- properly document working drawings,
- know conventional representation of such machine elements as bearings, seals, threaded elements, gears and springs.

Textbooks

1. Besterfield, D. 2006. Technical Sketching with an Introduction to AutoCAD (4^{th} ed.). 464 p. ISBN-10 012432781.

References

1. David Allan Law, A Manual of Machine Drawing and Design - Mechanical Drawing, ISBN-10: 1406797251, 2006
2. Earl J.H., *Graphics For Engineers with CADKEY*, Addison-Wesley Publishing Company, New York, 1991
3. Frank M., Fredrick D., Edwin T., Michael J., & John T., *Engineering Graphics*, John Wiley & Sons, New York, 1989

Assessment/Evaluation

- Class Exercises 20%,
- Project Work 40%, and
- Final Examination 40%.

COURSE TITLE: **ADVANCED COMPUTER AIDED DRAFTING**
COURSE NUMBER: **INDT 312**
CREDIT HOUR: **3**
PREREQUISITE: **COMPUTER AIDED MACHINE DRAWING**

Course Description

This course continues the development of the student's skills in using CAD hardware and software. Topics include basic commands of drawing and drawing settings, editing, dimensioning and text annotations using CAD software. Project work of two-dimensional mechanical drawing with CAD software is an important part of this course.

Course Objectives

Upon completion of the course the students will be able to complete two dimensional drawings using CAD software.

Textbooks

Ellen Finkelstein, 2009, AutoCAD 2010 and AutoCAD LT2010 Bible,

References

1. Cheryl Shrock, Exercise Workbook for Beginning AutoCAD, Industrial Press, 2009.
2. C. Jensen, J.D. Hensel, D.R. Short, "Engineering Drawing and Design", McGraw Hill
3. F. E. Giesecke, A. Mitchell, et al. Engineering Graphics", McGraw-Hill

Assessment/Evaluation

Project I	30%,
Project II	30%, and
Final Examination	40%.

COURSE TITLE: **FLUID MECHANICS**
COURSE NUMBER: **INDT 332**
CREDIT HOUR: **3**
PREREQUISITE: **APPLIED MATHEMATICS II**

Course Description

This course is an introduction to fluid mechanics. Topics include hydrostatics pressure in fluids; flow classification; properties of flows; viscous fluid and turbulent flow, fluid properties and definitions of density, compressibility, viscosity. The fundamental laws of fluid mechanics, continuity, momentum and energy, will be covered. Students will learn to predict pressure loss for fluid flow in various closed geometries.

Course Objectives

After completing this course, students will be able to:

- understand concepts, principles, laws, observations, and models of fluids at rest and in motion,
- provide a basis for understanding fluid behavior for engineering design and control of fluid systems,
- develop competence with mass, energy and momentum balances for determining resultant interactions of flows and engineered and natural systems,
- develop a bases for correlating experimental data, designing procedures, and using scale models of fluid flows,
- compute head-losses and flows in simple pipes
- learn to predict flow in various geometries.

Textbooks

R. Mott, Applied Fluid Mechanics, 6th Edition, 2005, ISBN-10: 0131146807

References

1. Streeter et al., *Fluid Mechanics, 9th sub edition,* McGraw-Hill **ISBN-10:** 0070625379
2. Munson B.R, *Fundamental of Fluid Mechanics*
3. Fox R.W., and McDonald A.T., *Introduction to Fluid Mechanics*

Assessment/Evaluation

Assignments	10%,
Mid-semester Examination	30%,
Project to demonstrate learning objectives	20%
Final Examination	40%.

COURSE TITLE: **FUNDAMENTALS OF THERMODYNAMICS**
COURSE NUMBER: **INDT 431**
CREDIT HOUR: **3**
PREREQUISITE: **APPLIED MATHEMATICS II**

Course Description

This course covers thermodynamic systems and introduces the fundamental principles. Topics include pure substances; vapor pressure curves; steam tables; phase diagrams of steam, first law of thermodynamics, closed and open systems, enthalpy; second law of thermodynamics, reversible and irreversible processes, the Carnot cycle; entropy and irreversibility.

Course Objectives

The course enables students to:

- understand the relationship between internal energy, heat and work as expressed by the first law of thermodynamics;
- apply the conservation of energy to thermodynamic systems
- state and explain the second law of thermodynamics
- explain how the Carnot cycle applies to heat engines and refrigeration cycles
- explain the concept of entropy
- apply the concept of availability, irreversibility and the second law in defining the efficiency of a system

Textbooks

Cengel Y A., Bole M A**.,** Thermodynamics – An Engineering Approach**,** 2007, McGraw-Hill.

References

1. Sonntag R.E.,*"Fundamentals of Thermodynamics"*, McGraw-Hill, 1999.
2. Michael J. Moran, H.N. Shapiro, *"Fundamentals of Engineering Thermodynamics"*, John Wiley and Sons. Inc., 1995.
3. Eastop T.D and McConkey A., *Applied Thermodynamics*

Wark K.Jr, *Advanced Thermodynamics for Engineers*, McGraw-Hill

Assessment/Evaluation

Assignments	10%,
Mid-semester Examination	30%
Project to examine heat flow	20%
Final Examination	40%.

COURSE TITLE: **ENGINEERING MECHANICS**
COURSE NUMBER: **INDT 212 SAME AS BCTE 232**
CREDIT HOUR: **3**
PREREQUISITE: **APPLIED MATHEMATICS I**

Course Description

This course covers both static and dynamic mechanical systems. Topics in statics include scalar and vector quantities, vector operations, force and force systems, resolution and composition of forces, moment of a force, couples, resultants, centroids, and distributed loads. Topics in dynamics include displacement, velocity, and acceleration, Newton's laws and concepts of work, energy and momentum. Laboratory exercises on measurement, force vectors and equilibrium and one and two dimensional motion are an important part of this course.

Course Objectives

Students completing this course will be able to:

- gain an understanding of the effect of forces acting on rigid bodies in equilibrium.
- understand the fundamental principles of forces, displacements, velocity, and acceleration and their effects on rigid bodies that are not in static equilibrium.
- understand the concepts of work, energy and momentum, and use conservation laws to solve problems.

Textbooks

1. Meriam J.L. and Kraige L.G. 2006. *Engineering Mechanics* –Statics . Wiley. ISBN-10 0471739326.
2. Meriam J.L. and L.G. Kraige. 2006. *Engineering Mechanics* –Dynamics (Volume 2). 736 p. ISBN-10 0471406457.

References

1. Bedford, A. M. and Wallace Fowler. 2007. Engineering Mechanics: Statics and Dynamics (5^{th} ed.). Prentice Hall, 1316 p. ISBN-10 013614257.
2. Hibbler R. C.2003. Engineering Mechanics statics and Dynamics, 10^{th} edition. Prentice Hall, ISBN-10: 0131417770.
3. Joseph Shelly. 1989. 800 Solved Problems in Vector Mechanics for Engineers Volume I. McGraw-Hill, ISBN-10: 0070568359.
4. Beer and Russell. 2009. Vector Mechanics for Engineers Statics, 9^{th} edition, McGraw-Hill. ISBN-10: 007727556X.

Assessment/Evaluation

Quizzes	10%
Mid-Exam	20%
Final Exam	40%
Laboratory work	30%

COURSE TITLE: **MECHANISM OF MACHINERY**
COURSE NUMBER: **INDT 451**
CREDIT HOUR: **3**
PREREQUISITE: **ENGINEERING MECHANICS**

Course Description

The course covers the performance of mechanisms and machines such as links and chain, cams and gears. Students will learn velocity and acceleration analysis of moving parts. Other topics include cams classification and design, gears and gear trains and force analysis of machinery.

Course Objectives

The course enables students to:

- develop an understanding of mechanisms and their motion types.
- learn techniques for velocity analysis (instant centers, vector polygons, analytical methods).
- learn techniques for acceleration analysis (vector polygons, analytical methods).
- develop knowledge of cam and gear system analysis.
- learn relationship between mass, forces and the motion of a mechanism

Textbooks

R. Norton, Design of Machinery with Student DVD, 2007, 848 pages, ISBN-10: 0073290980

References

Alem Bazezew, *Mechanisms of Machinery,* Addis Ababa University Press, 2001

Assessment/Evaluation

Assignments	10%,
Mid-semester Examination	20%,
Laboratory exercises	20%,
Final Examination	50%.

COURSE TITLE: **STRENGTH OF MATERIALS**
COURSE NUMBER: **INDT 342**
CREDIT HOUR: **3**
PREREQUISITE: **ENGINEERING MECHANICS**

Course Description

This course develops and applies analytical methods to determine the mechanical behavior of deformable bodies (stress, strain, and deflections) subjected to various types of loading. Students also become familiar with properties of industrial materials. Topics on stress include normal stress, shearing stress, ultimate stress, allowable stress, factor of safety and stress - strain diagrams, temperature stresses and torsion. Application is made to common industrial materials and geometries using materials properties in engineering handbooks.

Course Objectives

At the end of the course students will be able to:

- draw shears force and bending, moment and axial force diagrams.
- compute stress and strains in simple members subjected to axial loading, torsion, bending and combined loadings.
- use engineering tables to find materials properties
- perform laboratory testing of materials
- understand the impact on quality of material choice.

Textbooks

1. Ferdinand P.Beers & E.Russell Johnston.J.R. 2008. Mechanics of Materials. 816 p. ISBN10: 0071249990

References

1. James Gere et al., Mechanics of Materials SI Edition, 2008, 1024 pages, ISBN-10 0495438073
2. Hearn, E.S., *Mechanics of Materials* vol 1 & 2, **ISBN-10:** 0750632658, Butterworth-Heinemann
3. Nash, W.A., *Strength of Materials* (Schaum's Outline Series)

Assessment/Evaluation

Assignment	20%
Lab work	10%
Mid-semester Examination	30%,
Final examination	40%

COURSE TITLE: **ENGINEERING MATERIALS I**
COURSE NUMBER: **INDT 311**
CREDIT HOUR: **3**
PREREQUISITE: **NONE**

Course Description

This course covers the fundamental theory of engineering materials, failure mechanisms and material properties. Topics include atomic structure, bonds, crystalline structure, defects in crystalline structures and dislocation theory, deformation in solids, failure and mechanisms of fracture. Other topics include mechanical properties and testing of metals and phase transformations.

Course Objectives

The course enables students to be able to:

- understand the basic structure of engineering materials
- understand the influence of crystalline structure and types of defects and their influences on the properties of materials.
- understand how deformation will takes place and know the main types of plastic deformation
- anticipate the causes for failure, types of failure and know methods to overcome it.
- acquire knowledge about mechanical testing of materials
- understand phase and phase transformation, crystalline changes and their influences on properties of metals.

Textbooks

Materials Science and Engineering, an Introduction, 7th edition, John Wiley & Sons, 2006, **ISBN-10:** 0471736961

References

1. Donald Askeland, The Science and Engineering of Materials, 5th edition,
2. James F. Shackelford , Introduction to Materials Science for Engineers, 7/E **,**, 2009, ISBN-10: 0136012604
3. M F Ashby, H, Shercliff and D, Cebon, Materials: engineering, science, processing and design, Butterworth Heinemann, 2007

Assessment/Evaluation

Assignmentsand quizzes	20%,
Laboratory Exercises	10%
Mid-semester Examination	30%,
Final Examination	40%.

COURSE TITLE; **ENGINEERING MATERIALS II**

COURSE NUMBER: **INDT 322**
CREDIT HOUR: **3**
PREREQUISITE: **ENGINEERING MATERIALS I**

Course Description

This course starts with a focus on iron and steel. That section covers steels alloys, effect of alloying elements and heat treatment of steels, cast irons; families of cast iron production, properties and applications. The next section is a study of non-ferrous metals , inorganic non-metallic materials such as plastics and organic materials.

Course Objectives

The course enables students to understand:

- basic methods of iron and steel production;
- properties and applications of steels and alloyed steels;
- heat treatment process;
- properties and applications of different cast irons and non ferrous metals;
- causes of corrosion and theirs protection;
- properties and applications of non-ferrous metals and non-metallic materials

Textbooks

Materials Science and Engineering, an Introduction, 7th edition, John Wiley & Sons, 2006, **ISBN-10:** 0471736961

References

1. Donald Askeland, The Science and Engineering of Materials, 5th edition,
2. James F. Shackelford , Introduction to Materials Science for Engineers, 7/E **,**, 2009, ISBN-10: 0136012604
3. M F Ashby, H, Shercliff and D, Cebon, Materials: engineering, science, processing and design, Butterworth Heinemann, 2007

Assessment/Evaluation

- Assignments 10%,
- Laboratory Exercises 10%
- Mid-semester Examination 30%, and
- Final Examination 50%.

COURSE NAME: **INDUSTRIAL AUTOMATION AND CONTROL**
COURSE NUMBER: **INDT 412**
CREDIT HOUR: **3**
PREREQUISITE: **NONE**

Course Description

The course covers the basic features of automated motion control. Topics include sensors and transducers, process control and instrumentation, principles of industrial control, industrial hydraulics, industrial pneumatics and Programmable Logic Controllers.

Course Objectives

This course helps the students to understand industrial automation and acquire knowledge and skills to operate and maintain industrial automation components. Students will be able to:

- understand and apply basic principles that govern the motion of objects.
- develop appropriate mathematical models that represent physical systems.
- select appropriate coordinate systems for physical systems and analyze motion variables such as position, velocity, and acceleration.
- design, operate and maintain automated systems.

Textbooks

- Bolton, W.: Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, 3rd Edition, Prentice Hall, 2004, ISBN-10: 0131216333

References

1. Bolton, Programmable Logic controllers, 4th edition, Newness, 2006 ISBN-10**:** 0750681128
2. Stenerson, Fundamentals of Programmable Logic Controllers, Sensors and Communications , 3rd edition
3. Eaton Hydraulics Training Services, Industial Hydraulics, 5th edition
4. Michael B.Histand and David G. Alciatore, Introduction to Mechatronics and Measurement Systems 2nd Edition , McGraw-Hill International Editions, ISBN-10**:** 0072402415

Assessment/Evaluation

Mid-semester Examination	30%,
Laboratory Exercises	20%
Final Examination	50%.

COURSE DESCRIPTIONS FOR MAJOR FOCUS COURSES

COURSE TITLE: **DESIGN OF MACHINE ELEMENTS I**
COURSE NUMBER: **INDT 421**
CREDIT HOUR: **3**
PREREQUISITE: **COMPUTER AIDED MACHINE DRAWING**

Course Description

This course covers the fundamentals of machine design, load analysis, engineering materials, static stresses, elastic strain and failure mechanisms. Additional topics include impact and fracture and fatigue.

Course Objectives

This course enables the student to acquire the skill of identification and selection of proper safety factors to avoid failure before the expected life of the component. Topics include fatigue life and fatigue strength of machine elements, causes of stress concentration in machine elements; analysis and design of bolted, welded, and riveted joints; gears, shafts and springs, bearing and other machine elements such as crankshafts, connecting rods and pistons.

Textbooks

Juvenill, Marshek, Fundamentals of Machine Component Design, Wiley 4th ed, ISBN-10: 0471661775

References

1. Shigley's Mechanical Engineering Design (Mcgraw-Hill Series in Mechanical Engineering, 2006, 8th ed, ISBN-10: 0073312606
2. Norton, Machine Design an integrated approach, Pearson education, 2nd edition
3. Black, *Machine Design.* **ISBN-10:** 0070055246, McGraw Hill
4. Khurmi, R.S. and Gupta, J.K. *Text book of machine design.*

Assessment/Evaluation

Assignment	10%
Design Project	30%
Mid-semester Examination	30%
Final examination	30%

COURSE TITLE: **DESIGN OF MACHINE ELEMENTS II**
COURSE NUMBER: **INDT 422**
CREDIT HOUR: **3**
PREREQUISITE: **DESIGN OF MACHINE ELEMENTS I**

Course Description

This is the second course on machine element design focusing on applications to various machine components. Topics include design of fasteners and joints, gears, shaft design, springs, bearings and other machine elements such as; pistons, crankshafts and connecting rods, bearings, clutches and breaks.

Course Objectives

The course enables students apply the basic principles of materials mechanics in the design and analysis of typical machine elements. This course also enables students acquire the basic concepts of designing techniques through a practical design exercise.

Textbooks

Juvenill, Marshek, Fundamentals of Machine Component Design, Wiley 4th ed, ISBN-10: 0471661775

References

1. Shigley's Mechanical Engineering Design (Mcgraw-Hill Series in Mechanical Engineering, 2006, 8th ed, ISBN-10: 0073312606
2. Norton, Machine Design an integrated approach, Pearson education, 2nd edition
3. Black, *Machine Design.* **ISBN-10:** 0070055246, McGraw Hill
4. Khurmi, R.S. and Gupta, J.K. *Text book of machine design.*

Assessment/Evaluation

Assignment	10%
Design Project	30%
Mid-semester Examination	30 %
Final examination	30%

COURSE TITLE: **PRODUCT DESIGN AND DEVELOPMENT**
COURSE NUMBER: **INDT 551**
CREDIT HOUR: **3**
PREREQUISITE: **TECHNICAL DRAWING WITH SKETCHING**

Course Description

Product design and development is a project-based course that covers modern tools and methods for product design and development. The cornerstone is a project in which teams conceive, design and construct a prototype of a physical product. Topics include identifying customer needs, concept generation, product architecture, industrial design, and design-for-manufacturing.

Course Objectives

The course is intended to provide the students the following benefits:

- competence with a set of tools and methods for product design and development;
- confidence in abilities to create a new product;
- ability to coordinate multiple, interdisciplinary tasks in order to achieve a common objective.
- reinforcement of specific knowledge from other courses through practice and reflection in an action-oriented setting.

Textbooks

1. George E. Dieter, *Engineering Design, a Material and Processing Approach,* McGraw - Hill Inc., 2000.

References

1. Corrado Poli, Design for Manufacturing: A Structured Approach, Butterworth Heinmann, 2001, ISBN-10: 0750673419
2. Karl T. Ulrich, Steven D. Eppinger, *Product Design and Development,* McGraw - Hill Inc., 2004.
3. James Bralla, Design for Manufacturability handbook, 1998, McGraw Hill, **ISBN-10:** 007007139X
4. Boothroyd, Knight and Dewhurst Product Design for Manufacture & Assembly Revised & Expanded, CRC 2nd edition, 2001, ISBN-10: 082470584X

Assessment/Evaluation

Mid-semester Examination	30%,
Design Project	30%
Final Examination	40%.

COURSE TITLE: **INTRODUCTION TO INDUSTRIAL PROCESS AND MEASUREMENT**
COURSE NUMBER: **INDT 211**
CREDIT HOUR: **3**
PREREQUISITE: **NONE**

Course Description

This course provides an overview of industrial manufacturing in business, the industrial processes and materials used in those processes. Sustainability and environmental issues will be covered. The important role of metrology for industrial processes will be covered. This includes limits, fits and tolerances, application of tolerances, concept of interchangeability; linear and angular measurement, measurement of surface roughness, screw threads and gears.

Course Objectives

At the end of the course, students would:

- understand the role of industry in an economy
- know many of the important industrial processes and the materials involved
- know measure standards and the importance of measurement to quality control
- appreciate the importance of sustainability and environmental issues.

Textbooks

Dan Cuffaro, Process, Materials and Measurement, 2006, 264 pages, ISBN-10 1592532216

References

1. A.J.T. Scarr, “Metrology and Precision Engineering”, McGraw-Hill, 1967.
2. J.W. Greve, F.W. Wilson, “Handbook of Industrial Metrology”, Prentice Hall, 1967.
3. J.F.W. Galyer and C.R. Shotbolt, “Metrology for Engineers”, Cassell, 1969.

Assessment/Evaluation

Assignments	10%,
Class Exercises	20%,
Project Work	30%,
Final Examination	40%.

COURSE TITLE: **WORKSHOP TECHNOLOGY**
COURSE NUMBER: **INDT 232**
CREDIT HOUR: **2**
PREREQUISITE: **NONE**

Course Description

This course provides the students with hands-on experience with manufacturing processes. Topics include bench work; wood work, metal work, cutting with the aid of conventional machine tools; operation and maintenance of appliances and machines; welding, brazing and soldering; manufacture of parts and measuring and testing.

Course Objectives

The course gives the student practical training on basic workshop technology on bench work, sheet metal fabrication and hands-on experience on basic conventional machining

Textbooks

Rajender Singh, Introduction to Basic Manufacturing Processes and workshop Technology, New age publications, 2006

References

1. A Textbook of Workshop Technology ; Manufacturing Processes, S Chand, ISBN-10: 812190868X, India
2. Youssef et al., Machining Technology: Machine Tools and Operations, CRC, 2008, ISBN-10: 1420043390
3. Chapman W A, Elementary Workshop Calculations, Edward Arnold, 1981
4. Audel, Machine Shop Tools and Operations, 5th edition, Wiley

Assessment/Evaluation

Workshiop exercises 30%
Evaluation of project work: 70%

COURSE TITLE: **MACHINING TECHNOLOGY**
COURSE NUMBER: **INDT 331**
CREDIT HOUR: **3**
PREREQUISITE: **WORKSHOP TECHNOLOGY**

Course Description

The course is an introduction to metal machining, basics of lathe, drilling, grinding and milling machines. Tool geometry and basics of orthogonal and oblique cutting, tool materials, tool life and tool wear followed by thermal aspects of machining.

Course Objectives

The main objective of the course is to equip the students with the theoretical and practical skill of metal machining processes including: lathe operations, milling and grinding.

Textbooks

1. Youssef et al., Machining Technology: Machine Tools and Operations, CRC, 2008, ISBN-10: 1420043390

References

1. Kalpakjian, et al. Manufacturing, Engineering & Technology, 6th ed, Prentice Hall, 2009, ISBN-10: 0136081681
2. Wit Grezik, Advanced Machining Processes of Metallic Materials: Theory, Modelling and Applications, Elserver Science, 2008, ISBN-10: 0080445349
3. Geoffery Boothroyd and Winston A Knight, Fundamentals of Machining and Machine Tools, 3rd edition, ISBN 1- 57444-659-2, Taylor and Francis
4. Childs et al., Metal Machining theory and applications, Arnold press, 2000
5. Groover, Fundamentals of Modern Manufacturing, John Wiley and Sons (WIE); 3rd ed, ISBN-10: 0471742929

Assessment/Evaluation

Workshop exercise	20%
Project work	20%
Mid-Semester Examination	20%
Final Examination	40%

COURSE TITLE: **COMPUTER AIDED MANUFACTURING**
COURSE NUMBER: **INDT 512**
CREDIT HOUR: **3**
PREREQUISITE: **INTRODUCTION TO COMPUTER APPLICATIONS**

Course Description:
This course provides an introduction to computer numerical control (NC) for manufacturing. Topics include basic components of NC machine tools; manual NC programming; and CADCAM systems for programming,

Course Objectives
The course enables students to understand the fundamental concepts of computer-aided manufacturing. Upon successful completion of the course, students should be able to:

- understand tool path control systems
- write manual NC programs for the milling and lathe machines based on given part drawings,
- run the programs on the machine tools,
- model parts with CAD/CAM software,
- understand the automation and integration of manufacturing processes to achieve the ultimate efficiency of an organization's manufacturing resources;
- understand issues of GT, CAP, FMS, CAQC in CIM environment.

Textbooks

Groover, Automation, Production Systems, and Computer Integrated Manufacturing, 3rd ed., Prentice Hall, 2007, ISBN-10: 0132393212.

References

Assessment/Evaluation

Mid-semester Examination	30%,
Computer Exercise	30%
Final Examination	40%.

COURSE TITLE: **WELDING TECHNOLOGY**
COURSE NUMBER: **INDT 341**
CREDIT HOUR: **3**
PREREQUISITE: **WORKSHOP TECHNOLOGY**

Course Description

Students will learn several different welding processes including arc, MIG, TIG, gas and plastic welding along with learning plasma cutting and oxy fuel cutting. This class is highly project oriented and predominately a hands-on class. The student will learn many welding related skills in the program.

Course Objectives

The objective of the course is to teach the students with the basics of welding technology including arc and gas welding, MIG/MAG, electron beam, ultrasonic welding, plasma and laser welding techniques are introduced. Similarly the techniques of designing welds and testing of welding shall be introduced**.**

Textbooks

W. Bowditch et al., Welding Technical Fundamentals, 4th Edition, 2009, ISBN-10: 1605252568

References

1. Little R.L., Welding Technology, Tata McGraw-Hill, 2000. Partner R.S., Welding Process and Technology, Khanna Publishers, 1994
2. Lancaster J.F., Metallurgy of Welding George Allen and Unwin, 1991.
3. Welding Print Reading, latest edition, by J. R. Walker and W. R. Polanin. Goodheart-Willcox Company, Inc. publishers
4. Metals Hand Book, Volume 6, Sixth Edition, ASM, 1971.
5. AWS Welding Hand Book", Volume 1 to 4, AWS
6. Welding Processes by P.T.Hold Croft

Assessment/Evaluation

Workshop exercise	20%
Project work	40%
Mid-semester Examination	20%
Final Examination	20%

COURSE TITLE: **FOUNDRY TECHNOLOGY**
COURSE NUMBER: **INDT 321**
CREDIT HOUR: **3**
PREREQUISITE: **WORKSHOP TECHNOLOGY**

Course Description

The course introduces metal foundry practices and processes including patterns and pattern making, molding and core materials, standard tests, solidification, casting processes, cleaning and inspection, design for casting and recent advances in casting.

Course Objectives

The objective of the course is to teach the students the fabrication of metals using various foundry practices and processes. This is a practical course where students will visualize through their practical exposure the various foundry techniques including; sand casting, centrifugal casting and die casting techniques.

Textbooks

1. Peter Beeley, Foundry Technology, Butterworth Heinman, 2001

References

1 Campbell, J., Casting, 2nd edition, Butterworth Heinmann Oxford, 1993
1. Fundamentals of metals casting by Flimm; Addison Wesley.
2. Principles of metal casting by Heine Loper & Resenthal; Mcgraw Hill.
3. Product design & process engineering by Hielel & Draper; Mcgraw Hill.
4. Foundry practice by Salman & Simans; Issac Pitman.
5. Technology of Metalcasting, by Fred P Schleg, et al: American Foundry Society Inc., 2003. ISBN 0-87433-257-5
6. Metals handbook- metal casting; 111

Assessment/Evaluation

Workshop exercise	20%
Project work	20%
Mid-Semester Examination	20%
Final Examination	40%

COURSE TITLE: **METAL FORMING TECHNOLOGY**
COURSE NUMBER: **INDT 411**
CREDIT HOUR: **3**
PREREQUISITE: **WORKSHOP TECHNOLOGY**

Course Description

This course introduces metal fabrication using metal forming techniques. Students will be introduced to the basics of bulk and sheet metal forming technologies including; forging, rolling, extrusion, wire drawing, sheet drawing, sheet forming, deep drawing and the students will have intensive practical exercises in the workshop.

Course Objectives

This course will give a good perspective with adequate depth to understand the theory and practice of bulk forming processes, sheet metal forming theories, and special forming processes with intensive hands on practice.

Textbooks

1. Heinz Tischaetsch, Metal Forming Practice, processes-Machine-Tools, Springer Verlag, 2005.

References

1. Kalpakjian, etal. Manufacturing, Engineering & Technology, 6th ed, Printce Hall, 2009, ISBN-10: 0136081681
2. Marchiniak et al, Mechanics of Sheet Metal Forming,, Butterworth Heinemann,2002, 2nd edition
3. Schuler, Metal Forming Handbook, Sprineger Verlag, 1998
4. Dixit et al., Modeling of Metal forming and machining process
5. Beddoes, Bibby, Principles of Metal Manufacturing Processes, Butterworh Heinmann, 1999, ISBN-10: 0340731621
6. Groover, Fundamentals of Modern Manufacturing, John Wiley and Sons (WIE); 3rd ed, ISBN-10: 0471742929

Assessment/Evaluation

Practical exercises	20%
Practical projects	20%
Mid-Semester Examination	20%
Final Examination	40%

COURSE TITLE: **POLYMER AND COMPOSITE MATERIALS**
COURSE NUMBER: **INDT 432**
CREDIT HOUR: **3**
PREREQUISITE: **ENGINEERING MATERIALS II**

Course Description

The course covers polymeric materials, processing and design considerations. It also covers structure, mechanical and physical properties of polymers, degradation of polymers and types and properties of polymer-matrix composite materials. Manufacturing of components made of polymers and composite materials is included.

Course Objectives

The aim of this subject is to provide a basic understanding of the structure, properties, behavior, applications and manufacturing of polymers and composites.

Textbooks

1. A. B. Strong, Fundamentals of Composites Manufacturing: Materials, Methods, and Application, 2nd Edition, ISBN-10: 0872638545

References

1. George Menges et al., How to make injection Molds, 3rd edition, 2000
2. Arthur Kaw, Mechanics of Composite Materials, 2nd edition, 2006, CRC press
3. Snajay k. Muzumdar, Composites manufacturing, materials, products and process engineering, CRC press, 2001

Assessment/Evaluation

Practical Exercises	30%,
Mid-semester Examination	30%,
Final Examination	40%.

COURSE TITLE: **TOOL AND DIE DESIGN AND MANUFACTURE**
COURSE NUMBER: **INDT 452**
CREDIT HOUR: **3**
PREREQUISITE: **WORKSHOP TECHNOLOGY**

Course Description

The aim of the course is to teach the fundamental theory of the design and fabrication of jigs and fixtures. Topics include the study of tool and die making, including punch press sizes and feeds for dies, and their uses and relationships to each other.

Course Objectives

Students will be able to:

- comprehend tool design methods.
- acquire knowledge about tooling materials and their heat treatment process.
- develop skill in making of jigs, fixtures, selected tools and dies.

Textbooks

1. D. Spitler at al., Fundamentals of Tool Design, 5th Edition, 2003. Prentice Hall, ISBN-10: 087263650x

References

1. Ivana Suchy, Handbook of Die Design, 2nd Edition, McGraw Hill, 2006,
2. P.H. Joshi, Jigs and Fixture Design, McGraw Hill, 2003
3. Rong, Y. and Zhu, Y., Computer aided Fixture Design, Marcel Deker, NY, 1999

Assessment/Evaluation

Practical exercises	20%
Practical projects	20%
Mid-semester examination	20%
Final examination	40%

COURSE TITLE: **PROCESS PLANNING AND PRODUCT COSTING**
COURSE NUMBER: **INDT 522**
CREDIT HOUR: **3**
PREREQUISITE: **NONE**

Course Description

This course covers process flow of products, production process planning and automated process planning systems. Other topics include manufacturing cost items, principles of cost accounting; traditional product cost accounting and activity based product cost accounting.

Course Objectives

The course enable students to:

- understand the fundamental concepts in process planning and product costing;
- plan process of manufactured products;
- determine cost of manufactured products.

Textbooks

Peter Scallan, Process Planning: The Design/Manufacture Interface, 2003, ISBN-10 0750651296

References-

Assessment/Evaluation

Individual Assignment:	10%
Individual Design Project	20%
Mid Examination:	30%
Final Examination:	40%

COURSE TITLE: **INDUSTRIAL EQUIPMENT MAINTENANCE**
COURSE NUMBER: **IMT 531**
CREDIT HOUR: **3**
PREREQUISITE: **BASIC ELECTRICITY AND ELECTRONICS**

Course Description

This course covers equipment failures, their causes and the role of preventative maintenance. Topics include damages of typical machine components; determination of the state of damage of equipment, elements of maintenance technology, maintenance planning and organization, reliability, maintainability and availability.

Course Objectives

The course will enable the student to:

- understand theoretical and practical aspects of maintenance practice in industrial setup;
- understand basics of damages of typical components of machinery and thereby help the student realize the state of damage of machinery;
- realize the use of the concepts of reliability, maintainability and availability in maintenance technology which are helpful in the prediction of plant performance;
- understand the organization of a maintenance department, maintenance planning and decision making processes;
- develop practical skill by providing some practical work of maintenance;

Textbooks

1. Maintenance and Reliability Best Practices, R. Gulati and R. Smith, 2009, ISBN-10: 0831133112
2. R. Smith, Industrial Machinery Repair: Best Maintenance Guide Pocket Edition, 2003, **ISBN-10:** 0750676213..

References

1. Knotke, Stenerson, Mechanical Principles and Systems for Industrial Maintenance, Prentice Hall, 2005, **ISBN-10:** 0130494178

Assessment/Evaluation

Mid-semester Examination	30%,
Project	20%
Final Examination	50%.

COURSE TITLE: **INDUSTRIAL QUALITY MANAGEMENT**
COURSE NUMBER: **INDT 532**
CREDIT HOUR: **3**
PREREQUISITE: **NONE**

Course Description

The course covers the concept of quality and quality control. It includes quality philosophies, practices, tools and standards. The course also includes statistical concepts and techniques.

Course Objectives

The objective of the course is to introduce the student to understand

- quality control concept and techniques.
- the procedures for implementing quality engineering tools in industrial applications.
- basic metrology and applied statistics for quality control applications in discrete-item manufacturing systems.

Textbooks

1. A. Mitra, Fundamentals of Quality Control Improvement, 3rd Edition, 2008, ISBN-10: 0470256978

References

1. Montgomery, D.C, 2008, *Introduction to Statistical Quality Control*, 6th edition, John Wiley and Sons, ISBN-10: 0470233974
2. Farnum, Nicholas R., Modern Statistical Quality Control and Improvement.
3. Daniel Kitaw, Industrial Engineering, AAU
4. Feigenbaum A., Total quality control, Mc GrawHill Inc., Singapore
5. Juran J M, Quality control Hand Book, McGraw Hill company, London

Assessment/Evaluation

Project	30%,
Mid-semester Examination	30%,
Final Examination	40%.

COURSE TITLE: **INDUSTRIAL SAFETY MANAGEMENT**
COURSE NUMBER: **INDT 441**
CREDIT HOUR: **3**
PREREQUISITE: **NONE**

Course Description

This course offers an overview of health and safety goals and establishment of plans to implement them, track performance and take corrective action. Physical systems related to safety such as systems and control; electronic sensors; actuators; logic systems and data acquisition are included.

Course Objectives

The course enables the student understand how health and safety is implemented in industrial systems. Students will know:

- how to set goals, establish plans and implement them.
- how to track health and safety performance.
- how technical systems can affect health and safety.

Textbooks

Industrial Safety and Health Management, Prentice Hall, 5th edition, 2003 ISBN-10**:** 0131423924

References

1. Daughetry, Industrial Safety Management: A Practical Approach, Government Institutes, 2001, ISBN 10: 0865876363
2. David Collin, Industrial Safety: Management and Technology, Printce Hall, ISBN-10: 0134572351

Assessment/Evaluation

Mid-semester Examination	30%,
Laboratory Exercises	20%
Final Examination	50%.

COURSE TITLE: **INDUSTRIAL PROJECT MANAGEMENT**
COURSE NUMBER: **INDT 541**
CREDIT HOUR: **3**
PREREQUISITE: **NONE**

Course Description

The course covers concepts of project management such as events, activity, work breakdown structure, project planning tools, determination of the critical path and comparison of actual performance with the planned schedule. Development steps include project analysis, requirements definition, preliminary design, detailed design and implementation. Software used to draw project diagrams such as Gantt Charts, PERT diagrams, manpower loading chart are covered. Also included are feasibility studies, cost controls and project financing.

Course Objectives

The course will develop the skills to handle standard projects from the conceiving stage to implementation and commissioning. The course will:

- enable students to understand formulation of a project, project appraisal, project scheduling and performance analysis.
- improve the student's skills in qualifying an investment proposal and standardization of feasibility studies leading to better investment decision-making capabilities.
- give the student the insight to monitor the status of project at different stages within the scheduled time and to work in a cost effective manner; taking necessary control measures if deviations on intended deliverables are noticed on its way to realize the intended out comes.

Textbooks

1. Project Management Techniques, 2007, Rory Burke, John Wiley and Sons, Ltd.

References

1. Principles of Management, Koontz, Tata McGraw Hill
2. F L. Harrison, Advanced Project management, Gower Publishing House, England.
3. Harold Kerzner, Project Management with Project Management Case Studies, Wiley; 9Rev Ed edition, 2005
4. Harold Kerzner, Project Management: A Systems Approach to Planning, Scheduling, and Controlling, Wiley, 2005
5. Phil Baguley, Project management, Hodder and Stoughton
6. Robert K. Wysocki, Effective Project Management: Traditional, Adaptive, Extreme, Wiley; 4 edition, 2006
7. Scott Berkun, The Art of Project Management, O'Reilly Media, Inc.; 1 edition, 2005
8. SK. Bhattacharjee, PERT/CPM, and Project Management, Khanna Publishers, New Delhi.

Assessment/Evaluation

Evaluation:

Assignment	10%
Term paper	20%
Mid-semester Examination	30%
Final examination	40%

COURSE TITLE: **PRODUCTION PLANNING AND CONTROL**
COURSE NUMBER: **INDT 442**
CREDIT HOUR: **3**
PREREQUISITE: **NONE**

Course Description

This course covers types of production systems including techniques and applications of control concepts in the design of inventory and production. Project-planning systems include aggregate planning and master scheduling, MRP, MRP-II, job shop scheduling, forecasting techniques and basic concepts of OPT, JIT.

Course Objectives

The objective of the course is to assist the student to

- understand and appreciate of the fundamental principles and methodologies relevant to planning, design, operation, and control of production systems;
- understand the role and importance of productivity in the welfare of society, and learn how to increase productivity and quality for competing in today's global marketplace;
- gain ability to recognize situations in a production system environment that suggest the use of certain quantitative methods to assist in decision making;
- learn how to think about, approach, analyze, and solve production system problems using both technology and people skills.

Textbooks

1. Fundamentals of Production Planning and Control, S. Chapman, 2005, ISBN-10 013017615x

References

- Everett E. Adam, JR. Ronald, J. Ebert, *Productions and Operations Management*: Prince Hall, 1992
- James B. Dilworth, *Operations Management*: The McGraw-Hill Companies, Inc, 1996
- Riggs James L. *Production Systems: Planning, Analysis & Control*, New York: John Wiley & Sons Inc. 1970.
- Turner, Joe H. Mize, Kenneth E. Case , *Introduction to Industrial and System Engineering,* Prentice Hall ,Inc., Englewood Cliffs, New Jersey,1978

Assessment/Evaluation

Continuous assessment	30%
Mid-term Examination	30%
Final Examination	40%

COURSE TITLE: **FACILITY PLANNING AND PLANT DESIGN**
COURSE NUMBER: **INDT 521**
CREDIT HOUR: **3**
PREREQUISITE: **NONE**

Course Description

This course covers work area layout and equipment specification. Topics include assembly charting, machine load and labor, plant services, material handling and relationships between plant services and production. Methods covered include the facilities area relationship and allocation method; layout construction techniques, evaluation techniques and material flow analysis techniques. CAD is used as a facilities design tool together with computerized layout planning.

Course Objectives

The main objective of the course is to develop an understanding of the principles of facilities location, layout, and material handling systems and to practice designing facilities. The specific objectives include enabling the students to:

- learn formulations, models, and analytical procedures for the study of facilities layout planning
- learn fundamental principles of material handling
- be able to design layouts incorporating product, process, and personnel requirements
- understand quantitative approaches in developing alternatives of facilities planning and material handling problems;
- become skilled in using computer software in computer aided layout.

Textbooks

References

1. A. Tompkins et al., Facilities Planning, 3rd edition, John Wiley & Sons, Inc., New York, 2002. **ISBN-10:** 0471413895

Assessment/Evaluation

Assignment (	10%
Project	20%
Mid-semester Examination	30%
seminar	10%
Final examination	30%

COURSE TITLE: **APPROPRIATE TECHNOLOGY**
COURSE NUMBER: **INDT 511**
CREDIT HOUR: **2**
PREREQUISITE: **NONE**

Course Description

The course covers new technologies that may be appropriate for a developing country like Ethiopia. These include wind, solar, small-scale hydro. The nature of technological change; economics of technology; analysis for technology strategy; role of policy in the implementation of technology transfer; construction of an appropriate technology product; transfer of technologies and management for suitable development are all included.

Course Objectives

The course offers the student

- practical skills, knowledge and experience in the commercialization of new technological inventions.
- the skill to be involved in problem-solving teamwork in the major steps from proof of concept right through to intellectual property protection, prototype development, fabrication and assembly routes, materials procurement, identification and creation of new markets.
- the ability to develop a business plan and setting out the appropriate technology, marketing, distribution and financing routes and strategies for the specific technology under development.

Textbooks

1. Hazeltine & Bull, *Appropriate Technology; Tools, Choices, and Implications,*

References

1. Paul, Lowe, *The Management of Technology*, Chapman and Hall, 1995
2. Wicklein, Robert C., ed., *Appropriate Technology for Sustainable Living*, 2001 ISBN 0-07-825813-8

Assessment/Evaluation

Project	30%,
Mid-semester Examination	30%,
Final Examination	40%.

COURSE TITLE: **SENIOR RESEARCH PROJECT**
COURSE NUMBER: **INDT 542**
CREDIT HOUR: **3**
PREREQUSITE: **NONE**

Course Description

The senior project is a supervised practical project of appropriate standard in the field of specialization aimed at increasing the students understanding and awareness of his community's technical needs, and developing his ability to seek and find a solutions to them through independent research and experimentation. The project can be assigned by the department or suggested by the student and submitted for approval. Projects can be assigned for individual students or in groups of two or more.

Course Objectives

After completing this course, a student should be able to:

- work as part of a team.
- define and solve unstructured, technical problems.
- write a professional level technical report.
- develop and deliver a professional level oral presentation .

Textbooks:
No textbooks required.

Assessment/Evaluation

Project content	60%
Team participation	10%
Presentation	30%

COURSE TITLE: **INTERNSHIP**
COURSE NUMBER: **INDT 462**
CREDIT HOURS: **3**
PRESEQUISITE **FINISH THIRD YEAR**

Course description and objective:
This course supplements the student's academic program with experiential education. The internship experience will be guided by a learning contract outlining expectations and academic components. Three credit hours will be awarded for approved internships provided that all conditions of the learning contract are met. The internship will occur during the summer between the third and forth year. The intern will work regular work days for two and a half months.

Completion of the following assignments is the basis for earning college credit:

1. **Daily journal**: Students are required to keep a daily journal of their job experiences. If possible it is typed and double spaced and submitted electronically to the Entrepreneurship and Management Internship Coordinator each Monday covering the prior week. If the student has no computer access, a copy must be taken to the Coordinator each Monday.

2. **Special project and report:** The host employer and HUC Internship Coordinator will coordinate to select a special project relavant to the company for assignment and completion by the student intern. Concurrent with completion of the special project, the intern will prepare an executive-level business report appropriate for submission to top management. The student will present his/her project to the other internship students, the HUC Internship Coordinator and a representative of the host employer.

3. **Executive interview summary:** Students will interview one senior level manager to understand his/her career and discuss career development. Students will summarize the interview in a one (1)-page written document with the business card of the manager attached

4. **Job Performance and Satisfactory Evaluations:** The focus of the Internship course is to develop practical career-related experience. Performance evaluations are completed by the host employer during the Internship course and upon completion of the Internship course. At least two performance evaluations are documented to form the basis for grade assignment and awarding of college credit.

Grading and College Credit: The Accounting Internship Course requirements are weighted as follows for assignment of final grade and credit:

Daily journals	40%
Special project and report	40%
Executive interview summary	10%
Job performance evaluation	10%

COURSE DESCRIPTIONS FOR SUPPORT COURSES

COURSE TITLE: **APPLIED MATHEMATICS - I**
COURSE NUMBER: **MATH 205 RESPONSIBILITY: FOUNDATIONS**
CREDIT HOUR: **4**
PREREQUISITE: **NONE**

Course Description

This course provides the mathematics preparation needed for engineering courses. Topics include algebra, graphs; systems of linear equations; matrices, polynomial expressions; trigonometry; functions with inverses; introduction to differential and integral calculus

Course Objectives

The object is to equip students with basic mathematical techniques of algebra, graphs, vector algebra, trigonometry and basic functions to prepare students for calculus and help them develop skill build-up in mathematical analysis for solving engineering problems.

***Textbooks*:**

Stroud, K. A. 2007. Engineering Mathematics, 6th ed. ISBN: 978-0-8311-3327-6.

***References*:**

Nathan Niles. Calculus with Analytic Geometry, 2nd ed, Prentice Hall.

Assessment/Evaluation

Assignments 10%;
Mid examination 40%;
Final examination 50%.

COURSE TITLE: **APPLIED MATHEMATICS - II**
COURSE NUMBER: **MATH – 206 RESPONSIBILITY: FOUNDATIONS**
CREDIT HOUR: **4**
PREREQUISITE: **APPLIED MATHEMATICS I**

Course Description

This course is a continuation of Applied Mathematics I. It provides the advance preparation in mathematics needed for engineering. Topics include complex numbers, vectors, differential and integral calculus**,** differentiation applications, integration applications and differential equations.

Course Objectives

Students shall understand the mathematics including calculus of differential equations, needed for engineering.

Textbooks

Stroud, K. A. 2007. Engineering Mathematics, 6th ed. ISBN: 978-0-8311-3327-6.

References

1. Larson, R., Hostetler, R. P., and Edwards, B.H. 2005. Calculus with Analytic Geometry, 8th edition. Houghton Mifflin Company.
2. Lang, S. 2004. Linear Algebra, 3rd edition. Springer.
3. Stewart, J. 2002. Calculus, 5th edition. Brooks Cole.

Assessment/Evaluation

- Assignment 10%
Mid Term 40
- Final Examination 50%

COURSE TITLE: **INTRODUCTION TO PROBABILITY AND STATISTICS**
COURSE NUMBER: **STAT 301 RESPONSIBILITY: FOUNDATIONS**
CREDIT HOUR: **3**
PREREQUISITE: **APPLIED MATHEMATICS I**

Course Description

This course is designed to provide students an introduction to the basic science of statistics. Students will develop a useable understanding of research design, the organization of data, measures of central tendency and variability, central tendency theory, descriptive and inferential statistics, parametric and nonparametric tests, and basic test assumptions. Primarily, students will be introduced to the fundamental ideas of data collection and presentation, populations and samples; the presentation and interpretation of data, descriptive statistics, linear regression, and inferential statistics including confidence intervals and hypothesis testing. Basic concepts are studied using applications from economic ideas, education, business, social science, and the natural sciences. Also included is a mathematical introduction to probability theory including the properties of probability; probability distributions; expected values and moments, specific discrete and continuous distributions; and transformations of random variables

Course Objectives

At the end of the course, the students will be able to:

- acquire knowledge on statistical methods,
- collect and organize facts for statistical analysis,
- make interpretations of data collected, and
- make statistical inferences based on statistical analyses

Textbooks

Freedman, David, Purves, Pisani. 2006. Statistics. WW Norton & Co (ed). ISBN-10: 0393930432.

References

1. Berenson , Mark L; Levine, David M. and Krehbiel, Timothy C. (2008) Basic Business Statistics, 11th ed., Prentice Hall, USA
2. Black, Ken (1992) Business Statistics: an introductory course, West Publishing Company, New York
3. Brase, Charles Henry and Brase, Corrinne Pellillo (2006) Understanding Basic Statistics, 4th ed., Houghton Mifflin Company, New York
4. Kiemele, Mark J. (1997) Basic Statistics: Tools for Continuous Improvement, 4th ed., Air Academy Pr, New York
5. Lind , Douglas A.; Marchal, William G. and Wathen, Samuel A. (2007) Basic statistics for business and economics with student CD (CD-ROM), 6th ed., McGraw-Hill/Irwin, New York

Evaluation

Class Exercises/Assignments/Quizzes	30%
Mid-term	30%
Final Exam	40%

COURSE TITLE: **BASIC ELECTRICITY AND ELECTRONICS**
COURSE NUMBER: **ENGN 312 RESPONSIBILITY: INDT**
CREDIT HOUR: **3**
PREREQUISITE: **APPLIED MATHEMATICS II**

Course Description

The course is a basic course introducing the students about fundamental of AC & DC circuits, semiconductors and rectifiers, transistors and amplifiers and components of electronic control devices.

Course Objectives

At the end of the course the students understand the concepts fundamentals of DC and AC circuits, mesh and nodal analysis, theorems, single phase circuit with RL, RC and RLC elements in series and parallel circuits, Basic electronic devices-diodes, transistors, and semiconductor rectifier circuits.

Textbooks

Robert L. Boylestad, Electronic Devices and circuit theory, 9th edition, ISBN-10: 0131189050, Prentice Hall, 2005

References

1. Thomas Floyd, Electric Circuit Fundamentals, 8th edition, Prentice Hall, ISBN-13: 978-0135072936, 2009
2. David Buchla, Experiments in Electronics Fundamental and Electric Circutis Fundamentals, 7th edition, Prentice Hall, Cambridge University Press, ISBN-10: 0132197111, 2006
3. Thomas Hughes, Electrical and Electronic Technology, 10th edition, Pearson Prentice hall, 2008 , ISBN-10: 0132060116

Assessment/Evaluation

Laboratory	30%,
Mid-semester Examination	30%,
Final Examination	40%.

COURSE TITLE: **ELECTRICAL MACHINES AND DRIVES**
COURSE NUMBER: **ENGN 322 RESPONSIBILITY: INDT**
CREDIT HOUR: **3**
PREREQUISITE: **BASIC ELECTRICITY AND ELECTRONICS**

Course Description
The course introduces DC and AC machines, transformers, induction machines and the basics of electrical drives.

Course Objectives
At the end of the course the students will understand the concepts of DC and AC machines, characteristics and details of transformers, induction machines, conventional speed control techniques and electrical drive circuits.

Textbooks
Austin Hughes, Electric Motors and Drives: Fundamentals, Types and Applications, ISBN-10: 0750647183, Newness, 2003

References
1. Electrical Machines, by Theraja, Kanna Publishers, India, 2008
2. Gopal K. Dubey, Fundamentals of Electrical Drives, 3rd edition, Alpha Science International, Ltd; 2 edition, 2001

Assessment/Evaluation

Assignments/Quizzes	20%,
Mid-semester Examination	20%,
Laboratory	20%
Final Examination	40%.

COURSE TITLE: **PHYSICS LABORATORY**
COURSE NUMBER: **PHYS 202 RESPONSIBILITY: FOUNDATIONS**
CREDIT HOUR: **3**
PREREQUSITE: **APPLIED MATHEMATICS I**

Course Description:

The purpose of this course is to reinforce learning of physics theory by a series of practical laboratory exercises. The topics covered include 1-d and 2-d motion, force and motion, energy and momentum, circular motion, fluids, heat and temperature, wave motion, electric charge, electric potential and current, magnetism, reflection and refraction of light and mirrors and lenses.

Course Objectives:

The objectives are to reinforce past learning by practical exercises in important areas of classical physics, to improve the students problem solving skills and to improve the students skill in working with instruments and other technical equipment.

Textbook:

J.D. Wilson et al., College Physics, 6th Edition, 2007

Assessment/Evaluation

Laboratory Reports	30%
Mid-Term Examination	30%
Final Examination	40%

COURSE TITLE: **INTRODUCTION TO BUSINESS MANAGEMENT**
COURSE NUMBER: **MAEN 212 RESPONSIBILITY: MAEN**
CREDIT HOUR: **3**
PREREQUISITE: **None**

Course description*:*
This course focuses on the basic concepts and principles of management, the functions of planning, organizing, staffing, directing and controlling and their relationships to key issues in management practices, such as leadership and motivation. Nature and role of supervisory management, functions of supervisor and labor relations, inspection and effective communication are also discussed. Students will work in teams to improve their business proficiency by developing a marketing plan, based on all this semester's courses, and understand the role marketing plays in business and business management..

Course objectives:
Upon successful completion of this course, students should be able to

- develop a marketing plan
- explain the characteristics of management
- identify the evolution of management theories and practices
- define management functions i.e. planning, organizing, leading and controlling
- distinguish organization, theories of organizations and organizational structures
- apply the fundamentals of staffing, leadership theories and practices in the process of management.

Textbook

1. Burrow, J. et al., Business Principles and Management, 2007. ISBN-10:0538444681

References

1. Attner, Raumond F. and Perenket, Warner F.J., Introduction to Management, Kent publishing, Co. Boston, 1986
2. Griffin, Ricky W. Management, Houghton Miffin Co. Boston, 1984

Evaluation Scheme:

Continuous Assessment	25%
Midterm exam	20%
Project work	25%
Final Exam	30%

COURSE TITLE: **INTRODUCTION TO ENTREPRENEURSHIP**
COURSE NUMBER: **MAEN 211**
CREDIT HOUR: **3**
PREQUISITE: **None**

Course description

This course is an introduction to entrepreneurship. Topics include economic, social and political climate; demographic, technological and social changes; skills, challenges, and rewards of entrepreneurship. This course will provide a basic understanding of the entrepreneurial or new venture process. Students will discuss the critical role that opportunity recognition and creation plays in that process. Several class exercises will assist students to identify their own personal goals, and their unique skills and competencies related to the entrepreneurial process. Students will also develop a simple business plan, which will enable them to examine how entrepreneurs and investors create, find, and differentiate robust, money-making opportunities from "good ideas."

Course objectives

Upon successful completion of this course, students should be able to:

- develop a simple business plan.
- evaluate their own entrepreneurial tendencies and create a new venture.
- explain the role of entrepreneurship and new venture creation in economic development.
- evaluate and explain the real-world of entrepreneurship and the entrepreneurial mindset.
- understand the process of opportunity recognition and analysis.
- clearly articulate a new venture's business model.
- recognize the importance of teams in the entrepreneurial process and the pros and cons. associated with different behavior types when starting a new venture.
- be familiar with the financial issues associated with new venture start-ups.
- develop an understanding of entrepreneurship as a business behavior worldwide.

Textbooks

1. Entrepreneurial Small Business, Katz, Jerry and Richard Green, 2008, 848 p. ISBN-10: 0073405063

References

1. How to Write a Business Plan, Ethiopian Chamber of Commerce, 2004.
2. Small Business Management: Launching and Growing Entrepreneurial Ventures,J. Longenecker et al., 2007, 768 p. ISBN-10: 0324569728
3. Entrepreneurship in Action, Coulter, Mary,2nd., 2003, ISBN 0-13101101-4
4. Entrepreneurship, 7th, Hisrich, Peters, Shephard,(HPS) ,2008.McGraw-Hill

Evaluation Scheme:

Continuous Assessment	25%
Midterm exam	20%
Project work	25%
Final Exam	30%

COURSE DESCRIPTIONS FOR FOUNDATION COURSES

COURSE TITLE: **CIVIC AND ETHICAL EDUCATION**
COURSE NUMBER: **CEED 201**
CREDIT HOUR: **3**
PREREQUISITE: **NONE**

Course Description

This fundamental objective of Civic and Ethical Education is producing good citizens with higher civic qualities. Good citizen who are well aware of their rights and responsibilities as well as endowed with various type civic virtues such as active participation, tolerance, civic mindedness etc have a lot to contribute in the process of democratization and development of their own state. In view of this, this course is designed to familiarize students with basic themes and concepts of civic and ethical education, constitutionalism, Democracy, Human Rights and some other pertinent issues in achieving the basic goal of the subject matter. The very nature of civic education requires active participation from the part of students in various ways such as forwarding original arguments, participating in class discussions, debates, Presentation etc. . Thus students are highly expected to act accordingly for the successful delivery of the course. Professional ethics relates to fulfilling work responsibilities, honesty in financial matters and contributing to improvements in the workplace and profession. Ethical behavior also relates to society and the environment and includes tolerance, obeying the rule of law, respecting the rights of others, respecting the environment and practicing a sustainable lifestyle.

Course Objectives

The students will be able to:

- impart civic knowledge on various issues such as on meaning and definition of civics and ethics, constitutionalism, democracy, and human rights.
- help students clearly understand their rights and responsibilities and then exercise their rights and discharge their responsibilities.
- develop civic attitude such as patriotism, civic mindedness, active participation and tolerance.
- develop civic skills such as accurate decision making, expression of oneself clearly and logically and conflict resolution.
- understand the importance of professional ethics and to commit to ethical behavior in all aspects of a professional career.
- understand how to live in a diverse society by demonstrating tolerance and an appreciation of other cultures.
- learn to respect the environment and live in a sustainable manner.

Textbook:

1. Civic and Ethical Education, Alamirew G/Mariam, 2005.

References

1. Chekki Don. 1999. “Participatory Democracy in Action" International Profiles of Community Devt. New Delhi.
2. The Constitution of the Federal Democratic Republic of Ethiopia, August 21, 1995.
3. Universal Declaration of Human Rights: Adopted by the UN General Assembly in 1948.

Assessment/Evaluation

Community project	30 %,
Mid-semester	30%
Final examination	40 %

COURSE TITLE: **INTRODUCTION TO COMPUTER APPLICATIONS**
COURSE NUMBER: **COMP 201 RESPONSIBILITY: FOUNDATION**
CREDIT HOUR: **3**
PREREQUISITE: **NONE**

Course Description

This course is a broad introduction to the use of computers as tools for creativity, communications and organizing information. In addition to learning the technical fundamentals of computer use, students build skills in researching information, making appropriate ethical choices about the use of computers, and using technology to learn on their own and pass your new skills on to others.
The role of the computer as a communications tool will be central to this course. All students will be given computer accounts to maintain files. We will also emphasize the use of the Internet as a tool for finding information and the use of word processing, presentation software and image editing to organize and communicate ideas.
Topics will include computer hardware components, how the personal computer works and computer applications including word processing, spreadsheets, presentations, database and internet. Students are expected to learn to type and to practice exercises using MS Office.

Course Objectives

The students will be able to:

- familiarize themselves with components of computers and windows personal computers and operating systems
- use Microsoft Office as tools for writing, analyzing and presenting information
- use of information technology to assist you in other coursework
- use the internet for communications, research
- use traditional and nontraditional ways to find and share information
- create, edit and share pictures
- creating online and paper publications and graphics using computers
- understand ethical and responsible use of computer technology

Textbooks

1. Preston, John et al. 2008. Computer Literacy for IC3 – 2007 Update. 400 p. ISBN-10 0135038529.
2. Shelly Gary B. et al. 2007. Microsoft 2007: Introductory Concepts and Techniques, Windows XP Edition. 1224 p. ISBN-10 141884327X.

References

Sarah E.Hutchinson & Stacey C. Sawyer. Computers: The User Perspective.

Assessment/Evaluation

Assignments	50%,
Mid exam	20%,
Final exam	30%

COURSE NAME: **LEADERSHIP SKILLS**
COURSE NUMBER: **LEAD 501 RESPONSIBILITY: FOUNDATION**
CREDIT HOUR: **3**
PREQUISITE: **NONE**

Course description*:*
The purpose of this course is to encourage you to carefully analyze responsibilities and commitments in the context of leadership for the common good and for purposeful change. Students will come to understand the concepts of relational and servant-leadership and how they differ from traditional leadership theories. The course includes the study of leadership as well as the application of leadership theories, concepts, and skills. Students will also develop their leadership potential through the completion of personal and leadership self-assessments, values exploration, and leadership skill practice through course activities.

This course addresses the responsibility of a leader for business, society and himself. What will be the legacy of the professional leader? What difference does he make in all the networks in which he is participating? What is his basic attitude toward all the stakeholders? These kinds of questions are the core theme of this course.
Leadership will be combined with stakeholder management and current thinking about the role of communities in the business world.

Course Objectives

Students should be able to:
- Explain their personal opinion about stewardship'
- Reflect on his/her personal effectiveness as a leader;
- Perform as a transparent leader in his/her own networks

Textbook:
1. Peter Northouse, Leadership: Theory and Practice, 5th Edition, 2009, ISBN-10 1412974887
2. Kouzes and Posner, The Leadership Challenge, 4th Edition, 2003, ISBN-10: 0787984922

References:

Assessment/Evaluation

Leadership activities	20%
Leadership Self- Assessment	20%
Mid-Term Examination	30%
Final Examination	30%

COURSE TITLE: **INTRODUCTION TO ECONOMICS**
COURSE NUMBER: **ECON – 202 RESPONSIBILITY: FOUNDATIONS**
CREDIT HOUR: **3**
PREREQUISITE: **NONE**

Course Description

This course introduces and explores a variety of macroscopic and microeconomic topics, including: supply and demand, market equilibrium, elasticity, decision making by producers and consumers, production cost, market structures, public policy, the labour market, distribution of income, environmental policy, market efficiency and government intervention, aggregate supply and demand, market equilibrium, Gross Domestic Product, employment, income, prices, major schools of economic thought, fluctuations, growth, monetary policy, fiscal policy, the national debt, international trade, and international finance.

Course Objectives

Students should be able to:

- state the laws of supply and demand and explain the concept of equilibrium.
- identify and explain the basic principles of economics.
- enumerate and explain the three economic choices.
- provide a definition of gross domestic product and describe the four components.
- define fiscal policy and explain how it can be used to cope with fundamental economic problems.
- explain how monetary policy can be used to cope with fundamental economic problems.

Textbooks

Mankiw, H. G. 2008. Essentials of Economics, 5th ed. 584 p. ISBN-10 0324590024.

References

1. O' Sullivan, A., F. Sheffrin and S. Perez. 2009. Survey of Economics: Principles, Applications and Tools, 4th ed. 456 p. ISBN-10 0136093809.
2. Liberman, Marc and Hill, Robert E. 2005. Introduction to Economics 2nd ed. McGraw-Hill.
3. Begg, Fischer & Dornbusch. 2005. Economics, 8th, ed. McGraw-Hill Higher Education.
4. William G. Sullivan, Elm M. Wicks and James T. Luxhoj. 2003. Engineering Economy, 12th edition. Prentice Hall, Pearson Education Inc., Upper Saddle River, NJ.
5. Sullivan, G., James A. Bontadelli, Elin M. Wicks Richard E. Carmichael. 2006. Economics for Everyone: An Introduction to Economics.
6. Rohlf, William D. 2007. Introduction to Economic Reasoning (7th Edition). (Addison-Wesley Series in Economics).

Assessment/Evaluation

Assignments/Quizzes	30%;
Mid examination	30%;
Final examination	40%.

COURSE TITLE: **GENERAL PSYCHOLOGY**
COURSE NUMBER: **PSYC 201 RESPONSIBILITY: FOUNDATION**
CREDIT HOUR: **3**
PREREQUISITE: **SOPHOMORE ENGLISH**

Course Description

The introductory survey course explores the scientific study of human nature, behavior, and cognitive processes. The major areas of psychological study will be reviewed including history, biology, memory, learning, development, personality, abnormal and social psychology. Emphasis will be placed on applying psychological principles and data to life experience.

The course is also geared towards helping students conceptualize the psychological foundations of human behavior in all occupations. It is also the application of the principles and concepts in overcoming various kinds of human and environmental barriers for effective relationship.

Topics to be covered include motivation, emotion, knowledge retention, group dynamics and worker efficiency, sensation and perception, personality, and development of attitudes. Students will work on a proficiency task, developing a personal statement of goals and values.

Course Objectives

Upon satisfactory conclusion of the course, students will be able to:

- understand human behavior and relationship in different professions and life at large,
- be apply knowledge gained in the areas of business, government and education,
- familiarize themselves with group and individual decision-making,
- exercise effective human and environmental relationships.
- use their knowledge of psychology in developing a personal statement of goals and values

Textbooks:

Kalat, James. 2008. Introduction to Psychology, 8th ed. Wadsworth Pub. 04955102881.

References:

1. Weiten, Wayne and Diane Helpern. 2007. Psychology: Themes and Variations: with Concept Charts. Briefer Edition, 7th ed. Thomson-Wadsworth pub. 631 p. ISBN 10: 0495100587.

2. Wayne A Lesko. 2003. Readings in social psychology. General, classic and contemporary selections. Allyn and Bacon, Boston.
3. Snyder C R; Donelson R Forsyth. 1991. Handbook of social and clinical psychology: the health perspective. Pergamon Press, New York.
4. Series of Journal of experimental psychology
5. Series of Journal of general psychology

Assessment/Evaluation

Assignments	20 %,
Project, practical work	30%
Mid-semester	20%
Final examination	30 %

COURSE TITLE: **SOPHOMORE ENGLISH**
COURSE NUMBER: **FLEN 201 RESPONSIBILITY: FOUNDATION**
CREDIT HOUR: **3**
PREREQUSITE: **NONE**

Course Description:
A course designed to develop college-level reading and writing skills. It includes critical analysis of and written response to readings, as well as academic vocabulary, grammar and mechanics. It focuses on the steps of the writing process: planning, organizing, writing, peer review, revising, and editing while writing essays in various rhetorical patterns of organization and development. There will be in-class essays and others prepared outside of class. Students will write every day in class. In addition, students will improve listening and speaking skills through listening to lectures and taking notes, class discussion, giving short talks and responding to questions.

Course objectives:
This course will enable students to**:**

- understand and critically analyze class readings, as well as their textbooks
- improve their academic vocabulary, written and spoken grammar and mechanics usage
- improve their overall writing skills: being able to write clearly and correctly, make points and support them with examples and explanations.
- write under time pressure in answering essay examination questions.
- understand oral academic lectures and basic English conversation.

Textbook:

1. Evergreen: A Guide to Writing with Readings, 8th Edition. Susan Fawcett. 2007. Houghton-Mifflin/ Cengage

References:

1. Real Writing with Readings, Susan Anker, 2004, ISBN-10: 0312405219

Assessment/Evaluation

Tests: reading, grammar, vocabulary	20%
Writing assignments:	40%
Class participation in discussion	10%
Final exam, including writing	30%

COURSE TITLE: **PROFESSIONAL WRITING**
COURSE NUMBER: **FLEN 202 RESPONSIBILITY: FOUNDATION**
CREDIT HOUR: **3**
PREREQUSITE: **FLEN 201, SOPHOMORE ENGLISH**

Course Description
A course extending use of the writing process to longer essays based on analysis of readings, through awareness of audience, purpose and diverse viewpoints. Additional writing will be based on readings and research in students' professional fields, incorporating credible evidence through quotations, paraphrase and summary, according to MLA/APA standards. Studemts will learn to distinguish between opinion, facts and inferences and to use argument and persuasion. Students will work in teams on a proficiency task, writing a marketing plan
and presenting it to the class.

Course Objectives:
Students will be able to:

- write essays with a clear thesis, logical points to support the thesis, and evidence based on library and Internet research, using MLA/ APA documentation.
- avoid plagiarism by incorporating this evidence using documentation.
- improve their writing and proofreading skills through participating in peer review.
- write clear and concise reports and papers appropriate to their field of study, using library and Internet research. Business students will write business letters, memos, resumes, reports, and a business plan.
- use technical writing styles and formats: reports, proposals, analysis of technical articles, and learn the appropriate vocabulary used in their field.
- use improved speaking and presentation skills through class and small group discussions, and an oral presentation based on the final writing.
- develop and write a marketing plan.

Textbooks:

1. *Evergreen: A Guide to Writing w.Readings*, 8thEd.Susan Fawcett 2007. Houghton-Mifflin (now Cengage)
2. *Business Writers' Handbook*.8th Ed , Alred, Gerald J, Brusaw, Charles, and Oliu, Walter. 2006. Bedford-St. Martins. 590 p.. ISBN: 9780312352684
3. *Handbook of Technical Writing, 9th ed.* MacMillan. Alred,Gerald J, Brusaw, Charles, Oliu, Walter. ISBN: 9780312057336

References

1. *Technical Communication*. Michael Merkel, 9e. ISBN9780-312485979 Bedford St.M.
2. *Writing in the Disciplines:Supplement*,Tom Jehn, Jane,2007, ISBN10: 0312452640

Evaluation Scheme

Essays:	30%
Business/Technical writing assignments, including Project	50%
Final Assignment- Writing 10% Oral Presentation10%	20%

COURSE TITLE: **COMMUNICATION AND PRESENTATION SKILLS**
COURSE NUMBER: **FLEN 301 RESPONSIBILITY: FOUNDATION**
CREDIT HOURS: **3**
PREREQUSITE: **PROFESSIONAL WRITING**

Course Description:
This course is designed to improve students' speaking and listening skills, understanding of turntaking, and other conventions and strategies in English conversation through discussion and role play. They will give short talks, planned and impromptu, and receive feedback. Through group assignments and presentations, students will improve their ability to discuss controversial or difficult topics in a respectful manner and tone: listening for understanding, then presenting their views - in conversation, to solve a business problem, or to persuade. As a final project, students will research an area of interest in their field and write a paper on it, using properly documented sources, and then make a final oral presentation to the class using AV equipment. Questions and answers will follow each presentation.

Course Objectives:
Students successfully completing the course will have:

- developed a concern for audience and understand the importance of psychological approaches to the solution of business problems through skilled communication;
- the ability to use a variety of communication strategies, and know when to use them;
- developed presentation skills, oral and written, with or without AV equipment.
- developed an ability to apply critical thinking and decision-making skills to business
- developed an ability to work effectively with other people in small groups or teams
- learned to listen for understanding
- the ability to understand and negotiate differences in communication between oneself and people from other cultures and those with viewpoints disagreeing with one's own
- the ability to give and receive feedback that will improve one's own and others' communication

Textbook:

1. Guide to Managerial Communication. 7thEd Munter, Mary. Upper Saddle River, NJ,Prentice Hall 2005 ISBN: 0131467042
2. Locker, Kitty O and Kaczmarek, Stephen Kyo, Business Communication: Building Critical Skills, 2nd Ed. *McGraw-Hill/Irwin, NY 2004 ISBN 0-07-256219-6*

References:

1. *Business Writers' Handbook*.8th Ed , Alred, Gerald J, Brusaw, Charles, and Oliu, Walter. 2006. Bedford-St. Martins. 590 p.. ISBN: 9780312352684

Assessment/Evaluation

Classwork: discussions, role plays, short talks	20%
Assigned group and individual presentations	20%
Project work: business plan	30%
Quizzes:	20%
Final Exam	10%

1. APPENDIX: Further information on the Modular Curriculum, Section 4.0)

l. Core Engineering Science Modules

4.1.1. General
4.1.2. Thermal Engineering
4.1.3. Applied Mechanics
4.1.4. Materials Science
4.1.5 Industrial Control

2. Focus Modules and Internship

4.2.1 Industrial Engineering and Management

This has the task of transferring knowledge and skill necessary for efficient operation of production systems as affected by such elements as plant layout and system design, optimal management of materials and energy, and the integration of workers within the overall system.

4.2.2 Manufacturing Engineering and Technology

The main task of this module is to transfer knowledge and skill for designing, planning, operation and control of production processes involving machining, forming, casting and welding and modern manufacturing techniques etc.

4.2.3 Mechanical Design Module

The main task of the mechanical design module is in assisting knowledge and skill transfer in machine elements and their design procedures; product design methodology; design of equipment using mechanical engineering principles and in presenting designs in assembly and workshop drawing.

4.2.4 Industrial Internship

During their internship after the third year, students will have a chance to work on practical industrial problems, such as: manufacturing products using various types of machinery, developing further practical skills in job planning, quality inspection and management; also:
design, development and manufacture of complex products and/or product development, manufacture of prototypes and work in management areas - focusing on how to improve efficiency, productivity, production flow, product/process quality, cost reduction, or safety. Students are expected to be continually evaluated during their internship session and present a written report at the start of the new academic year.

4.3. Support Module

This has the task of transferring knowledge and skill in the mathematical techniques of calculus, vector algebra, statistical analysis, computer programming and computational methods for solving engineering problems. Students will also be equipped with basic electrical engineering concepts that are applicable in the field of industrial technology, knowledge of physics. Knowledge of business

management and entrepreneurship will enable the student to manage manufacturing organizations effectively and efficiently.

4.4 General Foundation Module: communication, humanities, economics, computers

The basic objective of this module is to enhance graduates' ability to develop their leadership, understand written and spoken information and produce sound technical communication; work in teams and solve problems, understand the governing rules of economic transactions; become democratic and ethical citizens.