

Syllabus

Course Description

MFMT 248 Power Engineering - Steam License Review

Credit Hours: 5 Total Contact Hours: 5

Prerequisites: Students must have access to an Internet connected computer utilizing either Netscape or Internet Explorer along with a readily accessible Internet service. Students should be familiar with and capable of navigating Windows-based programs, using basic word processing programs such as Word Pad, Microsoft Word or WordPerfect, use Internet "search" engines effectively, and be able to troubleshoot their own computer software and hardware problems. (Troubleshooting of computer hardware and software problems on a participating student's computer are the responsibility of the student taking the course and may not be considered as reasons for not completing the course in a timely manner)

Catalog Description:

A preparatory level Steam License Review course providing information, review of major and minor power engineering subjects including boilers, basic thermodynamics, boiler operation & maintenance, boiler & plant efficiency & emissions control, pumps, auxiliaries, power plant accessories, turbines, engines, electrical, compressors, internal combustion engines, power plant equipment, and review of national, state and local steam and boiler codes. Provides skill review in solving typical power plant problems and laboratory experiences as available related to practical exam skills, plant efficiency and basic thermodynamics.

The course is designed for students who have the necessary work experience and practical preparation to qualify to write for local license agency courses such as the City of Detroit, City of Dearborn, or for nationally identified examination agency exams such as NIULPE (National Institute for the Uniform Licensing of Power Engineers) 1st Class, 2nd Class or Chief Engineer's license examination. Normally 3-10 years of power engineering field experience is required for applicants to qualify for taking these license exams. The examinations are designed to 1) Test the applicants' knowledge in the area in which the license is being sought and, 2) Measure the applicants' ability to solve problems, interpret the steam code to operate a steam power plant safely and prudently.

Students study materials which are taken from workplace literature and actual field systems and utilize a workbook to complete multi-skilling tasks similar to those completed by skilled technicians in the field. Students are required to complete sketches, workbook exercises, and optional field activities along with quizzes and exams related to the study materials and field systems.

Additional Prerequisites/Corequisites: Power Engineers and Stationary Engineers seeking a First and/or Second Class Steam License have been working in the field a minimum of 5-6 years after completing their education or apprenticeship. Being an "on-line" course, prospective students should be computer literate, able to access the Internet readily, be familiar with e-mail systems, have the ability to easily work in a windows and Internet browser environment, be comfortable communicating in writing, be self-motivated and able to spend 6-12 hours of their time per week devoted to course study. Prospective students must have access to an Internet-capable computer utilizing a browser such as Internet Explorer or Netscape Navigator or must work from a computer in an on-campus lab.

Time Requirements:

As an On-Line Course, this course must be completed during a regular 16 week college semester meeting deadlines and forwarding assignments on the prescribed schedule. Exams may be taken on-line when specified.

Energy Technology On-Line Course Rules, Requirements and Constraints

In working with an on-line course there are a number of rules, specific requirements and some constraints which must be considered. Some of these are as follows. Others will be provided during the semester and provided as course information or announcements.

Requirements for the course:

- 1) Your grade will consist of scores on quizzes, required assignments, sketches (if required) and exercises during the course. Ucompass keeps a running tally of quizzes which are taken on line. Hand-in assignments will be graded and recorded separately by instructors.
- 2) The grading system at Henry Ford Community College is A=95-100, B=85-94, C=75-84, D=70-74, E=below 70.
- 3) You may attend optional lab sessions and oral quiz sessions held at the college or specially designated places as an option to the course - These are "options" and will not impact your final grade if you choose not to participate in these sessions.

Students are encouraged to attend minimally the lab sessions to access the "hand-on" equipment, systems and components available in the HFCC Energy Technology Cogeneration Facility. You can fire boilers, dis-assemble/re-assemble components,

start steam pumps, turbines and work with steam systems, as well as synchronize generators to the internal bus system.

4) To complete the course you must: a) complete all module quizzes/exams on line; b) complete all the required sketches and exercises in the workbook and submit them for grading, and c) complete any problems required for the course.

5) The course calendar will specify the start and completion times for the course and all elements during the course. Instructors must submit grades promptly at the end of the course and this fact does not allow any possible extension of time to complete un-completed assignments.

Students not meeting the specific time lines in the course by the end of the semester will be given an (I) or Incomplete for the course. To receive a grade for the course the incomplete must be made up - The student must make arrangements with an instructor to complete all course requirements prior to the 5th week of the following semester or the I will change to an E.

6) College policy requires students who wish to drop a course to do so prior to the 10th week of class (or 10th week of the semester for on-line courses). If a student does not officially drop prior to that point, an E will be recorded for the course rather than a drop.

Rules for the Course:

1) You must be on line working of the course 2-6 hours per week or more. Instructors will be tracking your "hits" into the program. Expect an e-mail or phone call if you are not meeting minimum requirements for accessing the course.

2) Each module will be accessible for up to three weeks on-line as will be noted in the course calendar. You must complete your study during this period and take the module quiz prior to the end of this period.

3) You may take each module quiz more than one time to enhance your grade. Normally the last time taken will reflect your final grade for the module.

4) Study assignments such as questions used to prepare for taking the module quizzes can be student corrected by checking your answers against the answers provided on line.

5) If you do not agree with answers on quizzes or exercises, and wish to "challenge" the answer - PLEASE correspond with the instructor by e-mail as follows: a) Identify where the question is located in the course materials by page and module number; b) Record and write out what you think IS the right answer; c) Identify the text, the edition, the page number and paragraph where you found the text material to support your answer. An instructor will review and respond to your request.

Please note that questions in many of the practice tests and exercises are taken from older license exams and as such tend to be sometimes vague and subject to interpretation. In addition, two different texts on the same subject may have different descriptions or interpretations of the same subject and may appear contradictory. Instructors will make every effort to assist you to obtain the most generally accepted answer to the question which will help you when taking a license exam.

Constraints for On-Line Courses

- 1) Of necessity, Energy Technology on-line courses are structured with modules to be completed in three-week segments. This means that the entire course is not self-paced (you cannot rush through the entire course in a shortened period of time) You must adhere to the calendar for the course and complete modules at the times they will be made available.
- 2) Lab sessions will be structured to meet at times when majorities of students are available. Hopefully, students will take advantage of these sessions at the times they are offered. You will be required to sign up for these sessions to ensure the maximum student loading in the laboratories are not exceeded. It will not be possible to complete all your lab sessions near the end of the semester - As some students wait until the last minute - thinking they can do all these items at one time - THIS IS NOT THE CASE. To complete all lab exercises, you must attend as many sessions as possible through out the semester.
- 3) When submitting exercises, sketches or problems - These may be submitted by snail-mail or at the lab sessions. Instructors will review these materials and where possible return them to you after posting the grades on line. To receive these materials after grading, you must provide a self-addressed - stamped mailing envelope for the instructor to return the items to you, otherwise they may not be returned.

ASSIGNMENTS - TURNING IN & EXCHANGING

4) CAUTION-VERY IMPORTANT: (Regarding assignments of large text or graphics files)

Please do not under any circumstances SEND LARGE FILES (greater than five pages) to an instructor or other student by e-mail! To do so may "plug-up " their e-mail system and/or cause a significant slow down in transmission and can cause the receiving person to think something is wrong with the computer when they cannot quickly open their e-mail after receiving such a file.

IF YOU HAVE LARGE ASSIGNMENTS to forward for grading utilize the options below as noted in priority order.

If you are unsure as to how to transmit them - check with an instructor first as to how to send them.

These options include:

a) USE THE STUDENT DIGITAL DROPBOX - You can UPLOAD files to the Digital DropBox for the instructor to view, grade and/or correct. Instructors can also post files with answers or other information for you to download.

(This prevents plugging up e-mails)

b) Use the Group Digital DropBox - If the instructor has placed students in groups and this feature has been activated - assignments from a group may be uploaded here.

c) Sending an assignment ON DISK by snail-mail (US Postal Service or other (UPS etc)

d) Sending a hard copy by snail-mail (US Postal Service or other (UPS etc)

Hard copies of sketches, lab exercises and other documents requiring scanning and bitmap or vector technology to enter the computer are presently BEST SENT as hard copies to the instructor.

Ancillary materials as they are available and considered important to the course will include manuals for hardware, equipment and systems and will be provided as deemed necessary in handout form. At times practical faculty-developed laboratory-type handout materials will be provided. Handouts if identified on specific troubleshooting, maintenance and repair topics will be used as they are available.

Course Goals – General Course Requirements and Recommendations

Overview

The course has been developed due to an identified need for a nationally available course to train Boiler/Heating (Low Pressure) Plant Operation and Maintenance engineers. There are over 1.8 million heating plant engineers throughout the US who have varying levels of competence. It is critical that these building engineers/technicians find the means to complete basic boiler training to ensure the safety of the equipment, the buildings and the building occupants where they are employed. This course covers both low pressure steam and hot water boilers and covers the necessary information required by engineers/technicians who must study for and take exams to be licensed to operate a low pressure boiler heating plant. The course is intended for both a local and a national audience and may be taken as part of on-line offerings

Energy Technology courses and programs provide students with the capability to meet or exceed the requirements for entry and advanced level multi-functional power or process plant engineers, boiler operators or heating plant operators, building engineers, HVAC heating and cooling service technicians, instrument and control technicians, and multi-skilled maintenance technicians. All courses in each program are performance-based, practically oriented to field conditions and are designed to ensure On-Line students meet minimum Licensing Requirements of local and national licensing agencies and as possible National Skills Standards.

Each course either, basic or advanced, provides students with the capability to meet or exceed the requirements identified by national organizations for entry level multi functional residential and light commercial HVAC service technicians, multi-functional power or process plant engineers, boiler operators or heating plant operators, building engineers. Courses include National Skills Standards requirements as specified by several nationally recognized heating/cooling field organizations including ARI/GAMA, (Air-Conditioning & Refrigeration Institute) and as specified by several internationally recognized power field organizations including NIULPE (National Institute for the Uniform Licensing of Power Engineers), local licensing agencies, VTECS (Southern Association of College and Schools), and National Skills Standards studies by HFCC faculty currently under way or completed for the occupation of power/building engineer.

Energy Technology On-Line courses and programs are computer-intensive requiring multi-skilled activities in a computerized environment and as possible a practical field orientation to assignments in multiple-activities on-line settings.

Required Computer Skills

Students who take classroom courses and/or on-line or web-based courses in the Energy Technology Program should be familiar with the basic word processor functions (such as found in MS Word Note Pad, Word Pad or WordPerfect for Windows. Students should have some experience using e-mail, have had experiences using typical search engines (such as Yahoo, Goggle or Excite) and accessing and utilizing the Internet to find information and materials from suppliers, library resources or other data banks. Students should also have easy, dependable access to a personal computer with a word processor and browser (such as Internet Explorer) to allow continuing Internet access during the semester. Students can utilize classroom computers to complete the majority of their assignments for classroom and web-based courses. However, students enrolled in on-line courses must have continuing access to a computer and the Internet throughout the semester usually apart from the college computers. While the Media Center and the Library computers can be used to complete on-line work for various courses, depending on them as the only computer source is not advised for on-line study.

During busy periods, accessing a computer may be difficult, and students will need to conform to the Media Center's hours. Therefore, it is recommended that students consider only using the Media Center as a backup to PCS at home or work. Students lacking basic computer skills should consider taking the MFMT 103 Computer Maintenance & Energy Technology - basic computer orientation course prior to or in conjunction with their initial (or first) course study in the Energy Technology Department.

HFCC Unplugged!

Now you can now access free wireless Internet service from more locations on HFCC's main campus. In addition to the Eshleman Library and the Student & Culinary Arts Center, the campus wireless network now encompasses the Technology Building and the Learning Technology Center. The wireless network, nicknamed "HFCC Unplugged," is available from 6 a.m. to 10 p.m. daily.

The wireless network gives students with laptops and PDAs (personal digital assistants) the freedom to connect to the Internet without wires. If you have a laptop, but need a wireless network card, check out the College Store, which sells network cards at competitive prices.

Core & Course Objectives

A) Major Core Course Subject Areas: Focus of Assessment

Course Objectives: **(See list at end of syllabus)**

The course is developed in a modularized form to allow each module to be taken in a stand alone format. It is recommended that students take all sections, even if they have extensive experience, to ensure complete coverage and review of the subject materials. In special cases, after background review and approval by an instructor, students who have previous skills and verifiable experiences can opt to enter at various points in the course. Additional lab activities will be incorporated to account for the various starting points.

Mandatory period for completion of the course: Students enrolling in the course will be expected to complete the course in the time period of one semester. Students should progress at the rate of one module per week. Students not completing the course in a one semester period will be eligible for one two month extension if it is determined by instructors the student can complete the course in that period. For students not completing the course in the required time, they must re-enroll and complete the course to receive credit and a completion certificate. Credit for previously completed modules will be given to students re-enrolling in the course after failing to complete it in the required time period.

B) Methods for Measuring Achievement of Objectives:

Practical assessment tests at the completion of each module are required. Internet exploration and research assignments require the student to enhance the learning process through interfacing directly with industry manufacturers, organizations, associations, data bases and similar resources. Standards for achievement are based on the developed national skill standards and licensing examination standards of various licensing agencies. A practice licensing exam is utilized as a final exam for the course.

General Course Requirements and Recommendations

Students are required to complete exercises and testing using basic computer skills. The course is partially On-line! Students taking this course must have regular access to a home computer connected to an appropriate Internet service, or, must have a laptop computer to access the wireless network at the college or must regularly access an Internet capable computer in one of the college computer-equipped laboratories.

Course Materials

The following materials are required for all students in classroom, and web-based sections. Students must come to every class with the textbook, workbook, a notebook, handouts, and projects and if applicable, floppy disks on which to collect data.

On-line students should have all texts, notes and other course materials available when access the course on the computer.

.Core Course Topics (See Major Core and Course Objectives above)

Course Grading Policy

A) Grading Policies:

Fulfilling course objectives and assignments requires that each student complete a range of assignments. In addition to exercises assigned throughout the semester. All Energy Technology courses include varying levels of the following elements:

1) Readings-Subject Matter Study: Access subject materials from texts, handouts, assigned resources and recommended materials.

2) Workbook/Written Activities Related to Readings/Lecture: Completion of assignments related to readings including answering text chapter questions, workbook questions, exercises and sketches.

3) Laboratory Activities: Completion of laboratory and hands-on exercises along with their related results reports and-or field experiences which duplicate laboratory hands-on experiences through live field activities.

4) Written and/or On-Line Exams:

a) Completion of required written or on-line exams for each unit/module for each course when required.

b) Completion of proctored written or on-line final and/or mid-term exams for each course.

c) Completion of standardized competency, license and certification exams (such as those provided by ARI, NIULPE, EPA and others)

d) Completion of short quizzes, practical lab exams, classroom-lab practical exercises and other activities used to check progress, understandings and prerequisites for advanced study in a course.

5) Reports, Projects: Completion of individual reports, papers, projects, presentations assigned by the instructor.

6) Internet Exploration Assignments: Completion of a minimum of four to eight subject-matter enhancement activities/reports by obtaining information and data on the Internet relative to the course subject matter.

7) Attendance: There is no mandatory classroom attendance for on-line courses. Optional open labs are offered for students who desire hands-on experiences and/or direct study to answer questions and work on license exam preparation with an instructor.

Grades are based upon the regular HFCC College scale as follows:

Below 70=E, 70 to 74=D, 75 to 84=C, 85 to 94=B, 95 to 100=A

B) Each instructor will determine the percentage of the allocated to the individual elements for a course as noted above. A "typical" (but not mandatory) assignment of percentages is as follows:

(Individual instructors may vary these percentages in the course they are teaching)

1) Readings-Subject Matter Study 5-20%

2) Workbook/Written Activities Related to Readings/Lecture 20-30%*

3) Laboratory Activities (Optional - 5-20%)*

4) Written and/or On-Line Exams 50-60%*

5) Reports, Projects 5-20%*

6) Internet Exploration Assignments 10-20%*

7) Attendance (Not required-May attend Option Open Labs)

TOTAL - 100%

Note: *Items which may be adjusted by an instructor significantly upward or downward in totally on-line courses reflect activities for that mode of instruction.

Participation & Drop Policy

Students are expected to complete all weekly assignments and activities contained within this course. Penalties may be imposed, at the discretion of the individual instructor, whenever the quality of the student's work has been affected by non-participation and non-completion of course assignments and activities.

Course Participation/Attendance-On-Line Courses:

Students in Energy Technology on-line courses are expected to be involved in a minimum of one scheduled instructional activity per week. To meet this expectation, learners must make contact with the course or instructor on a weekly basis through one of the following methods:

- 1) Completing an assignment (e.g., an exam, project, etc.) in the Exam or Assignment of the course web site.
- 2) Participation in a threaded discussion in the course web site Discussion Board (e.g., commenting on a discussion question posted by the faculty, posing a question or asking a questions, providing feedback to another Learner, etc.).
- 3) Viewing instructional materials (e.g., Notes or data provided in announcements or assignments, a PowerPoint presentation prepared by faculty, a streaming audio or video presentation, etc.).
- 4) Students must use the UCompass Messaging system on the course web site to contact faculty and/or other students in the course.

IMPORTANT!! Students who fail to make contact within the time period of one month may be notified that they will be withdrawn or suspended from the course.

Assignment Submissions:

In most instances, students will responding with completed assignments by taking an exam, entering data collected, using the Discussion Board to participate in a discussion, entering the Chat Room to participate in a "live" Chat session with the instructor and-or other students, or sending an assignment to the instructor via e-mail. Make sure when completing each assignment that you submit only one assignment at a time. Bulk (multiple) assignments will not be accepted.

Communication:

When you send an e-mail or "create" a new assignment or complete course work, (IMPORTANT) Use the first few lines of any communication to indicate your name, course number and section, assignment and Module Number.

File Format:

When sending any information in a "file" format - Save the file in RTF (Rich Text Format) in your word processor before you attach this file to your correspondence. RTF (Rich Text Format) will allow the instructor to gain quick access to any file from any word processor to speed up the grading and review process.

Discussion-Chat:

This course allows students to post to a Class Discussion Forum or participate in Chat Room activities. You can locate the Discussion Board forum or Chatroom by clicking on them on the left side of your Ucompass Main Screen. Discussion Forums topics provided by the instructor or students remain up most of the semester for continued access by students. Use the instructor discussion forum when a question arises or a concern or information may need to be provided. Chatroom usage may be scheduled by the instructor or may be used by

Tuition Refunds

Refunds on tuition and fees (except registration fees) may be obtained on all classes of fifteen-week duration officially dropped according to the following schedule:

100% 1st week of classes

50% 2nd week of classes

No tuition refunds are given after the end of the second week of classes and no exceptions are made for students who enter late.

Courses of other than fifteen-week duration have differing refund schedules. Details may be obtained in the Office of the Registrar. Students receiving federal financial aid have additional refund options available to them. They should review the brochure Financial Aid Information Guide and Consumer Information Supplement, available in the Financial Aid Office.

Online Conduct Policy

A) Students at HFCC are expected to show respect for order, law, the personal rights of others, and the educational mission of the College, as well as to maintain standards of personal integrity.

B) Students working online will be held to the same behavioral standards as students in traditional classrooms.

Please be aware that instructors will be observing your threaded discussions with each other, and may review those discussions, commenting where appropriate with the goal of helping you to better understand the course content. Specifically, you should adhere to the following guidelines:

- Personal correspondence should be conducted elsewhere.
- Treat and respect others as you would like to be treated.
- “Flaming”, an angry series of words or comments used to personally attack others who may disagree with you, is not permitted.
- Take time to review the tone, language, word choice, spelling, and grammar of any written correspondence prior to sending it. You will be judged by the quality of your work.
- HFCC’s computer use policy is in effect. It can be found at <http://www2.hfcc.edu/resources/policy.htm>.
- Students are responsible for completing their own online course work.

Academic Dishonesty Policy on Academic Dishonesty (Cheating)

A) College Policy on Academic Dishonesty (Cheating)

Henry Ford Community College considers academic dishonesty to be a serious offense. It is the policy of the College that determination of and appropriate action in respect to academic dishonesty by a student shall be a matter of individual judgment by the instructor. The instructor may administer a penalty up to and including failure in the particular course. It is the professional obligation of the faculty to enforce academic integrity in their courses.

Academic dishonesty is any activity intended to improve a student’s grade fraudulently.* It includes, but is not limited to, the following:

1. Unauthorized acquisition of tests or alteration of grades (such as the stealing of tests, test keys, or grade books from faculty offices or elsewhere, or the purchasing of tests or grade books);
2. Unauthorized use of notes, books, or other prohibited materials during an examination;
3. Open cheating on an examination (such as copying from another student’s paper);
4. Permitting another person to take a test in the student’s place or receiving unauthorized assistance with any work for which academic credit is received;
5. Providing unauthorized assistance with any work for which academic credit is received;
6. Revision of graded work in an attempt to receive additional credit fraudulently;
7. Plagiarism (using another person’s work without acknowledgment);
8. Any other conduct intended to obtain academic credit fraudulently or dishonestly.

B) Energy Technology Policy for Computer-Utilized, On-Line and Web-Based Courses

The following practices for students taking Energy Technology courses are considered improper and prohibited according to the Academic Dishonesty Policy or as a violation of the Copyright Act:

- 1) Submitting Xerographic-type copies of any work - All work should be original and submitted in original writing-printing.
- 2) Copying or reproducing tests or examinations for on-line courses - This material is covered by the copyright act and as such is proprietary to the instructor or the college and is NOT to be reproduced UNDER ANY circumstances.

IMPORTANT! Copying the exams and/or answers to written or computerized exams is considered grounds for immediate failure in the course according to the Academic Dishonesty Policy!

Assignments, student completion sheets, forms, handouts, course packs, computer links and other material provided by instructors may be copied (usually in one copy only as required) by students for their individual use in completing course activities.

- 3) Completing specifically identified computerized final exams or written exams with the help or assistance of another person or having another person complete work on any of your exams and submitting this work as your own.
- 4) Falsifying assignments, copying another person's work, or completing any worksheets, lab assignments, or required hands-on lab exercise sheets - which require actual hands-on lab or research work to be completed prior to submission.

Student Support Services

Instructional Technology & Tech Buddies If you require assistance accessing UCompass Educator courses, please contact Instructional Technology at 313.845.9663, ext. 3, 4, or 5 or via e-mail at signorelli@hfcc.edu, kolin@hfcc.edu, or vbeaty@hfcc.edu.

On-campus assistance is also available in the Student Center at the Tech Buddy Desk or within Instructional Technology, Monday - Friday, 8:30 a.m. - 4:30 p.m. Instructional Technology is located on the lower level of the Learning Technology Center (same building as Campus Safety), room A-004.

Media Center

Located on the second floor of the Library, the Media Center is an open access computer lab where students can go to work on computer assignments, access the Internet, and/or check their e-mail. For more information, you may contact the Media Center at 313.845.6386. For more information regarding Library Services, you may phone 313.845.9606.

Assisted Learning Services

The Assisted Learning Services Program is designed to assist physically challenged, learning disabled, or academically disadvantaged students at Henry Ford Community College to overcome barriers to education through supportive services. In addition, the Assisted Learning Services Department also provides tutoring services to the general student population. Assisted Learning Services is located in the LRC (Learning Resources Center), north side (parking lot side) main level. For more information, you may contact the office at 313.845.9617 or for the hearing impaired 313.845.9804.

Learning Lab

Located on the second floor of the Learning Resource Center, the Learning Lab assist HFCC students with identifying and improving the skills needed for success in the areas of Reading, Writing, and Math.

Although operation hours may slightly vary each semester generally, the Learning Lab is open Monday, Tuesday, Wednesday, Thursday, from 7:30 a.m. – 8:40 p.m., on Friday from 7:30 a.m. – 4:30 p.m., and Saturday from 9:40 a.m. – 1:40 p.m. For more information, contact the Learning Lab at 313.845.9643.

Course Topic-Outline-Assignment Sheet - MFMT 248 Steam License Review Course

Students may utilize the Student Assignment Completion Sheet as a Checklist of the activities which must be accomplished for completion of the course.

(Page numbers for Workbook are shown after each assignment)

MODULE 1-1 BOILER CODES & STANDARDS

Codes & Standards 1-2

Ordinance Questions (Answer Questions-Check Answers on-line) 1-11
Engineering & Reference Data-Seam Tables, Conversion Tables etc. 1-14
Using the Steam Tables -Article 1-22
Thermodynamics & Basic Cycles 1-27

MODULE 1-2 BASIC THERMODYNAMICS 1-30

Heat-Temperature-Water-Steam 1-31
Heating Water-Making Steam -Figuring Water Heating 1-41
Adding Heat to Water & Steam 1-43
Basic Thermodynamics Problems (5 Problems) (Calculate Problems-Check Answers on-line) 1-44
Basic Thermodynamics -Finding Steam & Vapor Values using the Steam Tables and 1-47
basic thermodynamic calculations -(Calculate Values -Check Answers on-line)
Steam Trap Familiarization 1-48
Steam Trap Maintenance Exercises and Quiz -Check Answers on-line 1-59
Practices Heat Fundamentals Quizzes: 1-65, 1-66, 1-68, 1-69, 1-73 (Check Answers on-line) 1-65
Problem/s Module 1
MODULE 1 TESTS A,B,C,D -Heat Fundamentals, Steam, Codes Take On-line

MODULE 2-1 RATINGS BOILER 2-1

Boiler Ratings -Shields 2-2
Boiler Ratings Exercises 2-14, 2-22

MODULE 2-2 FIRETUBE BOILERS 2-32

Steel Firetube Boilers -Shields 2-33
Vertical Firetube boiler 2-43
Sketch-Vertical Firetube Boiler (VFT) 2-49
Horizontal Return-Tube Boiler (HRT) 2-50
Sketch-HRT 2-56
Scotch Firetube Boiler (SFT) 2-57
Sketch-SFT 2-64
Locomotive Boiler 2-65
Sketch-Locomotive Boiler 2-68
Package Firetube Boilers 2-69
Package Firetube Boiler Controls & Flame Safeguard Systems 2-79
Sketch-Package Firetube Boiler 2-87
Firetube Boiler -Quiz -Check Answers on-line 2-95
Problem/s -Module 2 (Check Answer/s on-line)
MODULE 2 TEST Take On-line

MODULE 3-1 WATERTUBE BOILERS 3-1

Steel Watertube Boilers -Shields 3-2
Higher Pressure Boilers -Article 3-9
Advantages of Watertube Boilers 3-67
Older WT Boilers (Box Header, Wickes, B & W, Stirling-4/Drum) 3-68
Stoker Fired WT Boilers 3-77
Specifications-B & W Package and Larger WT Boilers 3-85
Sketch -B & W Sectional Header Boiler 3-99
Sketch -Box Header Boiler 3-100
Sketch -Stirling Multi-Drum Central Station Boiler 3-103
Sketch -Central Station Single Drum Boiler (DTE St Clair Blr-P. 3-114) 3-104
Flexible Tube WT Boiler Specifications -Cleaver-Brooks 3-105

MODULE 3-2 WATERTUBE PACKAGE BOILERS

Packaged Boilers -Shields 3-121
C-E Package Boiler 3-129
Watertube Boilers-General -Quiz -Check Answers on-line 3-136
Watertube Boilers -Questions -Quiz -Check Answers on-line 3-137
Problem/s -Module 3 (Check Answer/s on-line)
MODULE 3 TEST Take On-line

MODULE 4 BOILER CONSTRUCTION 4-1

Steel Boiler Manufacture Shields 4-2

Sketch -Braces & Stays 4-18

Sketch -Tubes, Staybolts and Waterlegs 4-19

Waterwall Construction 4-20

Drum Construction 4-31

Boiler Metals 4-38

Boiler Circulation 4-51

Fusible Plugs 4-53

Questions -Type of Steel -Boiler Construction Check Answers on-line 4-69

Questions -Material Stress/Resistance to Boiler Loading Check Answers on-line 4-72

Questions -Joint Efficiencies -Riveted Joints Check Answers on-line 4-75

Questions -Stresses on boiler Tubes Check Answers on-line 4-78

Problem/s -Module 4 (Check Answer/s on-line)

MODULE 4 TEST Take On-line

MODULE 5-1 SAFETY VALVES 5-1

Definition-Boiler Accessories, Auxiliaries, Fittings, Appurtenances, Appliances 5-2

Safety Valves 5-3

MAWP Formula Variations 5-15

Sketch -Economizer Safety Valve 5-22

Sketch -Drum Safety Valve 5-23

Safety Valve Setting -Basic Data/Specifications form Code 5-24

Safety Valve Basic Information 5-33

Questions -Safety Valves Check Answers on-line 5-40

MODULE 5-2 BOILER PIPING-VALVES-GAGES 5-41

Typical Boiler Valving-Maintenance & Operation 5-42

Single Boiler Piping to Header 5-43

Steam Boilers in Battery Piping to Header 5-44

Hot water Boilers in Battery Piping to Headers 5-46

Sketch -Stop Check Valve 5-47

Sketch -Angle Stop Check Valve 5-48

Sketch -Check Valve, Gate Valve 5-49

Boiler Piping, Fittings, and Joints 5-50

Valves & Their Operation 5-62

Pressure Measuring Instrument & Pressure Gages 5-65

Water Level Indicators 5-72

Pressure Gages -Data 5-82

Sketch -Pressure Gage 5-85

Questions -Steam Piping-Power Plant Check Answers on-line 5-86

Questions -Steam Separators 5-89

MODULE 5-3 WATER COLUMNS/GAGE GLASSES 5-90

Water Column -Definition and Information 5-92

Water Column Blockage -Information 5-105

Exercise -Water Column Blockage Check Answers on-line 5-107

Sketch -Cast Iron Water Column 5-112

Questions -Water Column Check Answers on-line 5-113

Sketch -Water Column (Firetube Boiler) Check Answers on-line 5-114

Water Column and Gage Glasses 5-118

MODULE 5-4 SOOT BLOWERS -SYSTEMS 5-123

Soot Blower -Ash Removal Information 5-125

Soot Blower Locations/Types 5-131

Sketch -Soot Blower 5-140

MODULE 5-5 BOILER FEEDWATER REGULATORS 5-141

Bailey Thermo-Hydraulic BFW Regulator -Manufacturer's Data 5-143

Copes BFW Regulator -Manufacturer's Data 5-148

Exercise -Boiler Feedwater Regulator Component Identification Check Answers on-line 5-159
Float-Type BFW Regulator 5-160
Single Elements BFW Regulators 5-162
Multiple Element Feedwater Regulators 5-166
Boiler Feedwater Heaters 5-174
Problem/s -Module 5 (Check Answer/s on-line)
MODULE 5 TEST Take On-line

MODULE 6 -HEAT RECOVERY-STEAM PURIFICATION EQUIPMENT 6-1
Blowdown Systems, Drum Internals, Air Heaters, Economizers, Superheaters, Reheaters
MODULE 6-1 -BLOWDOWN SYSTEMS, DRUM INTERNALS 6-2
High Pressure Blowoffs & Drains 6-3
Blowdown Tank Diagram 6-4
Blowdown Purpose/Data 6-6
Boiler Blowdown & Steam Purification 6-10
Boiler Blowoff Tanks and Valves 6-19
Sketch -Quick-Opening Valve 6-26a
Sketch -Blowdown Tank & Seatless Valve 6-26b
Sketch -Drum Internals 6-26c

MODULE 6-2 SUPERHEATERS, REHEATERS, ATTEMPERATORS 6-27
Superheaters, Reheaters, Attemperators 6-28
Superheaters, Desuperheaters, Reheaters 6-41

MODULE 6-3 AIR HEATERS, ECONOMIZERS 6-57
Economizers & Air Heaters -Shields 6-58
Placing Air Heaters in Operation 6-71
Air Heater-Economizer Data 6-76
Types of Economizers 6-83
Problem/s -Module 6 (Check Answer/s on-line)
MODULE 6 TEST Take On-line

MODULE 7
FUELS, COMBUSTION, GAS-OIL-COAL BURNERS, COMBUSTION EFFICIENCY,
POLLUTION CONTROL
MODULE 7-1 FUELS AND COMBUSTION
Fossil Fuels -7-3 (HCFPO)
Fuels & Combustion -7-27
Combustion of Coal 7-43
Oil Atomization 7-48
No. 6 FO System/Train 7-50
Gas Valve Train 7-51
Sketch-Oxygen Bomb Calorimeter 7-53
Questions -Fuels & Combustion Part 1 -7-53a
Questions -Fuels & Combustion Part 2 -7-53e

MODULE 7-2 GAS-OIL-COAL BURNERS
Natural Gas Fired Boilers -7-55
Oil Fired Burners -7-65
Pulverized Coal Boilers -7-73
Stokers -7-89
Fluidized-Bed Boilers 7-101
Fuel Burning Equipment 7-109
Proximate/Ulimate Analysis 7-245
Pulverized Burners 7-151
Gas Valve Train 7-163
Questions -Coal 7-167
Questions -Combustion & Combustion Air Supply 7-167
Questions -Fans & Draft 7-167
Questions -Gas Burners 7-168

Questions -Oil, Oil Burning 7-168
Questions -Refractory, Stokers 7-169
Questions -Combustion and Burning Systems 7-170
Questions -Oil Burning, Furnaces, Draft 7-174
Questions -Stacks, Fans, Draft,Economizers,Air Heaters 7-178

MODULE 7-3 FANS-DRAFT-COMBUSTION CONTROLS

Fans,Stacks, Draft 7-184
ID and FD Fans 7-194

MODULE 7-4a COMBUSTION EFFICIENCY-POLLUTION CONTROL

Combustion Efficiency 7-198
Boiler Maintenance & Operational Modifications for Efficiency Improvements 7-213
Boiler Efficiency Improvement Equipment 7-217
Ranking of Energy Conservation Approaches for Boilers 7-220
Sketch -Bacharach -Combustion Analyzer 7-221
Sketch Orsat Combustion Analyzer 7-222
Questions -Boiler Combustion Efficiency Testing 7-223
Questions -Combustion Testing & Combustion Test Instruments 7-223
Questions -Efficiency Improvement methods and Means 7-223
Questions -Fundamental Combustion for Efficiency Improvement 7-223

MODULE 7-4b POLLUTION CONTROL

Emission Control/Test. Procedures 7-225
Discharge of Pollutants 7-226
Equipment to Comply with Law 7-228
Dust Collectors for Coal Fired Heating and Power Plants 7-234
Emission Testing 7-235
Air Pollutants of Concern -EPA 7-138
Environmental Regulations 7-247
Continuous Emission Monitoring 7-263
Particulate Control 7-280
Questions -Operating Emissions Requirements 7-289
Questions -Methods for Completing Prep for Emissions Testing 7-289
MODULE 7-1, 7-2, 7-3, 7-4a, 7-4b TESTS -Take On-line

MODULE 8 BOILER OPERATION & MAINTENANCE

Vertical Firetube Boiler Packet -Lattner & Fulton Boilers 8-2
Package (small) Watertube Boiler Packet -Model 4 Cleaver Brooks 8-18
CSD-1 Controls & Safety Devices -ASME Code-Michigan Law 8-38
Combustion of Gas & Oil Fuels 8-40
Burner Control Systems 8-42
Typical Gas-Fired Piping 8-44
Typical Oil-Fired Piping 8-46
Lessons from Losses on Boilers 8-49
Flame Failure Controls for Power Engineers 8-51
Boiler Operation 8-63
Typical Boiler Start-up 8-69
Operation of Stokers 8-71
Preparing Boilers for Inspection 8-74
Hydrostatic Testing 8-75
Laying Up Boilers -8-76
Handling Low-High Water 8-84
Interlocks -Boiler Systems 8-95
Questions -Boiler Accessories 8-97
Questions -Emergency Actions for Abnormal Conditions 8-97
Questions -Fittings 8098
Questions -Maintenance & Testing 8-98
Questions -Operating Boilers 8-99
Questions -Start-up Shutdown of Boilers 8-100

Questions -Stokers 8-100
Questions -Boiler Operation and Maintenance 8-101
MODULE 8 TEST Take On-line

MODULE 9 INSTRUMENTS AND CONTROLS

Introduction -Basic Boiler Combustion Controls 9-2
Temperature Control 9-8
Questions -Controls 9-12 & 9-13
Boiler Interlocks 9-14
Turbine Interlocks 9-17
Electrical Interlocks 9-18
Questions -Interlocks 9-19
Combustion Controls -Basics 9-21
Exercise (pencil) -Reading-Interpreting Boiler Control Board Diagrams(Block Diagram) 9-32
Exercise (pencil) -Block Diagram for 3-Element BFW control
Lab Exercise -Checking Control System for Accuracy & Repeatability 9-38
Sketch -Bailey BFW Controller 9-44
Sketch -Copes BFW Controller 9-45
Questions -Instruments & Controls (**OPTIONAL**) (9-46 to 9-51)
(MUST HAVE: Optional Text -Instrumentation for Process Measurement & Control -Chilton, 3rd Ed, N. Anderson, to complete these questions)
MODULE 9 TEST Take On-line

MODULE 10a PUMPS, BFW HEATERS, EVAPORATORS

Basic Pump Information 10-3
Boiler Feeding Equipment & pumps 10-35
Types of Pumps 10-65
Questions -Pumps, Boiler Feeding 10-68a
Questions -Basic Pump Theory & Problems 10-68c
Questions -Reciprocating Pumps & Pump Theory 10-68g
Questions -Basic Pump Systems Problems 10-68k
Questions -Reciprocating Pumps (Optional) 10-68n
Questions -Centrifugal Pumps 1 10-68t
Questions -Centrifugal Pumps 2 10-68z

MODULE 10b BFW HEATERS, EVAPORATORS

Basic Information of Feedwater Heaters 10-70
Feedwater Heaters 10-72
Evaporators 10-80
Questions -Boiler Feedwater heaters 10-86a
Questions -Injectors 10-86e
MODULE 10a, 10b TESTS -Take On-line

MODULE 11 WATER TREATMENT

Water Treatment -Part 2 (Handout) 11-2
Basic Water Treatment Definitions 11-24
Boiler Water Treatment 11-48
Lime Soda-Ash Processes 11-56

Questions -Water Treatment Part 1 -11-66
Questions -Water Treatment Part 2 -11-70b
MODULE 11 TEST -Take On-line

MODULE 12 STEAM ENGINES

Simple Steam Engines 12-2
Questions -Steam Engines Part A -12-35
Questions -Steam Engines Part B -12-43 (starting with No. 19)
MODULE 12 TEST -Take On-line

MODULE 13a STEAM TURBINES-CONDENSERS

Basic Steam Turbine Information 13-3
Modern Steam Turbines 13-14
Steam Turbine (Handout) 13-44
Questions -Steam Turbines -Part 1 -13-72k
Questions -Steam Turbines -Part 2 -13-72o

MODULE 13b STEAM TURBINE OPERATION

Turbine start-up and basic information 13-74
Turbine Operation and Maintenance 13-105
Single Flow Turbine 13-110
Governing Principles 13-124
Questions -Steam Turbines -Part 3 -13-138a
Questions -Steam Turbines -Part 4 -13-138d
Questions -Steam Turbines -Part 5 -13-138f
Questions -Steam Turbines -Part 6 -13-138h
Questions -Steam Turbines -Part 7 -13-138j
Questions -Steam Turbines -Part 8 -13-138m
Questions -Gas Turbines -Part 9 -13-138q

MODULE 13c CONDENSERS, EVAPORATORS

Steam Condensers 13-140
Questions -Condensers -13-150
Questions -Evaporators, Spray Ponds 13-154
MODULE 13a, 13b, 13c TESTS -Take On-line

MODULE 14 POWER PLANT ELECTRICAL

Basic Electrical Information 14-2
Synchronizing Generators 14-9
Questions -Electrical Fundamentals 14-29
Questions -DC Fundamentals 14-34
Questions -DC Generators 14-37
Questions -DC Motors 14-42
Questions -AC Fundamentals 14-46
Questions -AC Generators 14-51
Questions -AC Motors 14-58
Questions -Transformers 14-62
Questions -Electrical Maintenance & Safety 14-63
MODULE 14 TEST -Take On-line