ME478
INTRODUCTION
TO
SOLAR ENERGY UTILIZATION

LECTURE 1

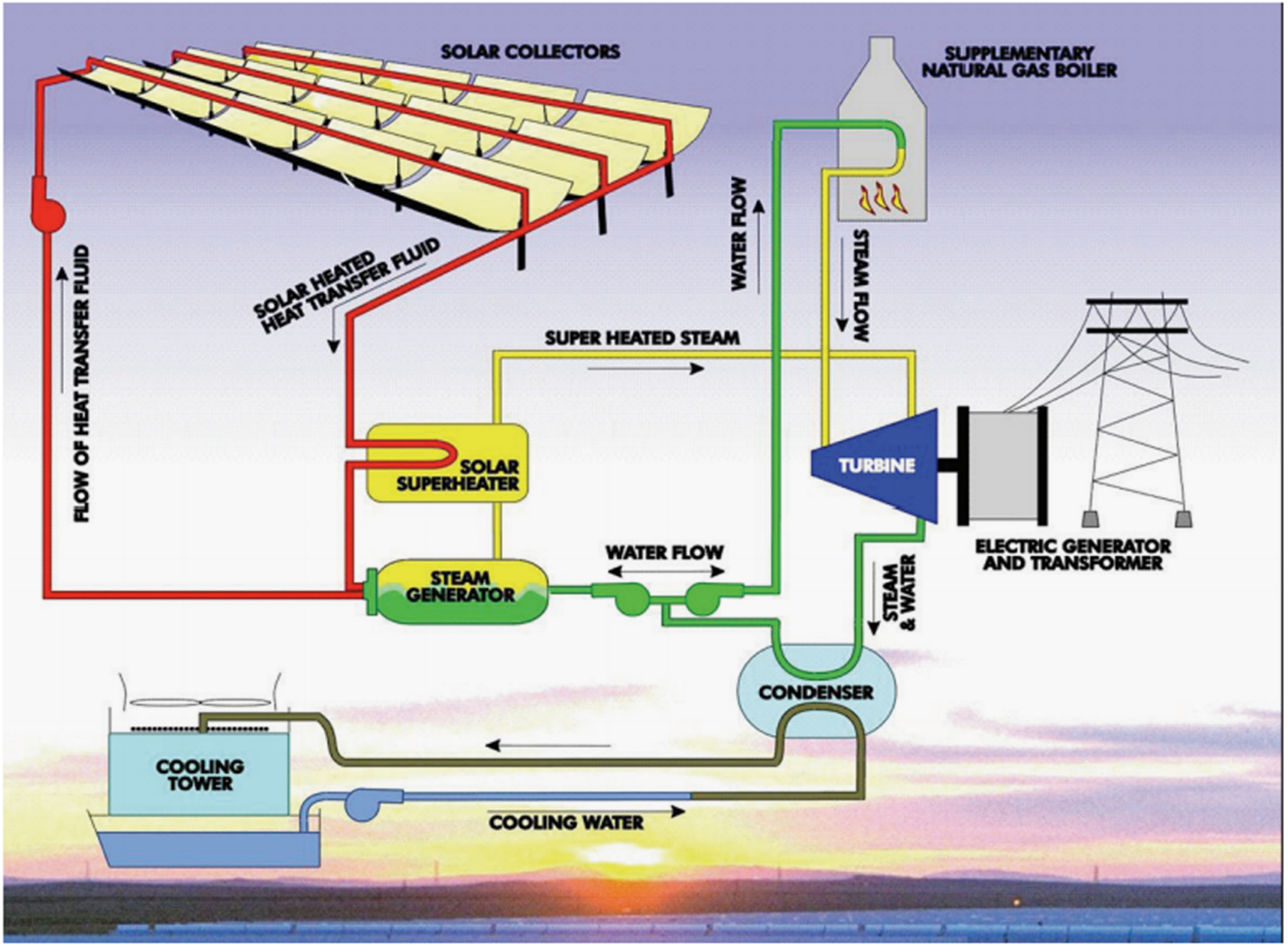
PROF. DR. ILKER TARI
E-104, itari@metu.edu.tr

ME312 or equivalent is a must!

All of the topics covered in ME312 are needed for ME478 thus you need a passing grade from ME312 to take this course

ME 312 THERMAL ENGINEERING

Subject (tentative lecture length)	**Reading**
Internal Flow (8 lecture hours)	Chapter 8
Free Convection (6)	Chapter 9
Boiling and Condensation (6)	Chapter 10
Heat Exchangers (9)	Chapter 11
Radiation (9)	Chapters 12-13
Mass Transfer (4)	Related parts of Chapters 14, 6, 7 and 8

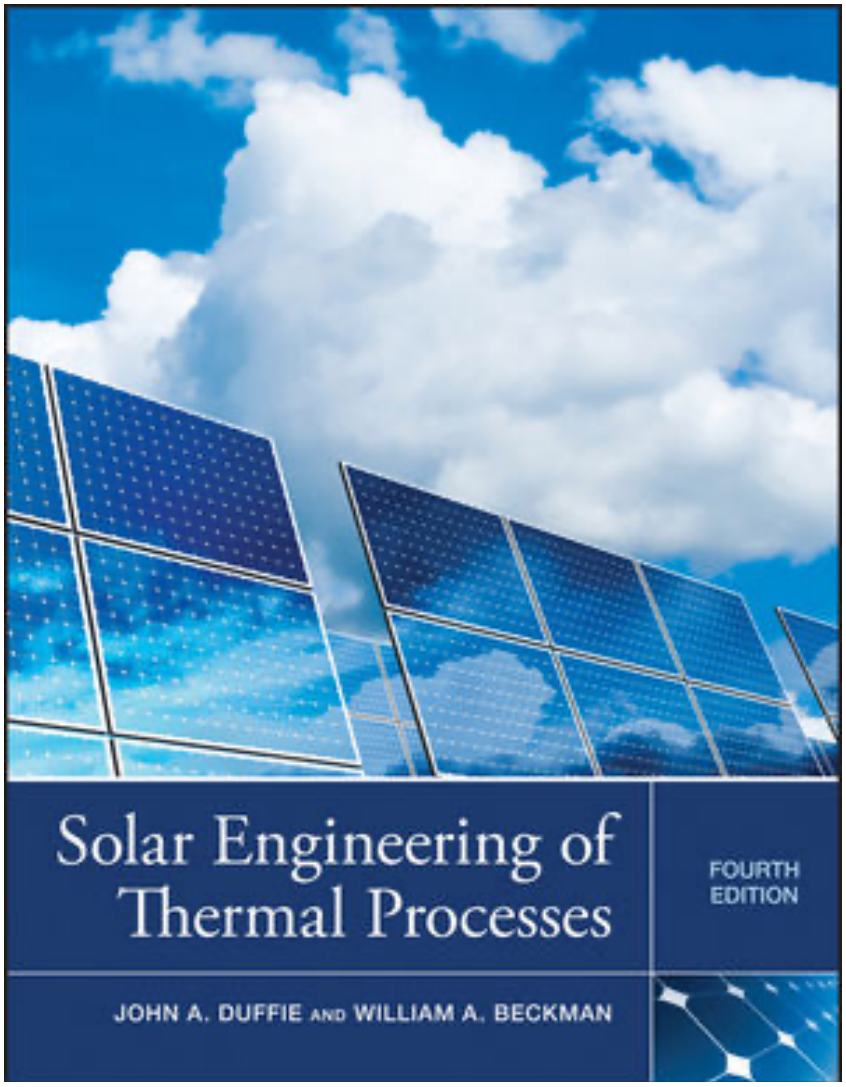

SOLAR COLLECTORS
SUPPLEMENTARY NATURAL GAS BOILER
WATER FLOW
STEAM FLOW
FLOW OF HEAT TRANSFER FLUID
SOLAR HEATED HEAT TRANSFER FLUID
SUPER HEATED STEAM
SOLAR SUPERHEATER
TURBINE
ELECTRIC GENERATOR AND TRANSFORMER
WATER FLOW
STEAM GENERATOR
STEAM & WATER
CONDENSER
COOLING TOWER
COOLING WATER

ME478 - INTRODUCTION TO SOLAR ENERGY UTILIZATION

- *Instructor :* Prof. Dr. İlker Tarı, E-104 (ICHMT), itari
- *Assistant :* Deniz Pınarlı, A-146, pinarli.deniz
- *Text :*

  Solar Engineering of Thermal Processes, 4th Edition by John A. Duffie, William A. Beckman, Wiley
- *Schedule :*
  - Monday 8:40-10:30 in G202
  - Wednesday 12:40-13:30 in G202.
- *Web page :* http://users.metu.edu.tr/itari/me478

Solar Engineering of Thermal Processes, 4th Edition
by John A. Duffie, William A. Beckman



Available through METU Library subscription from Wiley online book collection

Course topics and time plan

Week	***Topics***	***Chapter***
1	Radiative Transfer and Conjugate Heat Transfer in Solar Collector Applications	3
2	Radiation Characteristics of Opaque Materials	4
3	Radiation Transmission through Glazing: Absorbed Radiation	5
4	Solar Radiation basics	1
5	Available Solar Radiation	2
6	Flat-Plate Collectors	6
7	Flat-Plate Collectors	6
8	Concentrating Collectors	7
9	Concentrating Collectors	7
10	Energy Storage	8
11	Solar Process Loads	9
12	System Thermal Calculations	10
13	Solar Engineering Applications	Part II
14	Solar Engineering Applications	Part II

- Attendance to the first lecture is required. The students will be selected according to their ME312 grades and CGPAs from the first lecture attendance list.
- *Homework:* The problems will be assigned weekly and collected on time. Some will include SMath Studio calculations or some programming.
- *Attendance :* 100% attendance is expected. Participation is extremely important.
- *Grading :*

Midterm Exam	: 30%
Homework and attendance	: 30%
Final Exam	: 40%

SMath Studio

Tiny, powerful, free mathematical program with WYSIWYG editor and complete units of measurements support.
It provides numerous computing features and rich user interface translated into about 40 different languages. Application also contains integrated mathematical reference book.

*Download: version **0.99.7030** - Stable (released at 2019-04-01) - recommended*

SMath Studio Desktop (2.24 MB) Downloads: **73152** of **753943**

SMath Studio Desktop for Mono (1.37 MB) Downloads: **19197** of **99755**

GET IT ON Google Play | Download on the App Store | Get it from Microsoft

*Download: version **0.99.7251** - Beta (released at 2019-11-08)*

SMath Studio Desktop (2.28 MB) Downloads: **4534** of **753943**

SMath Studio Desktop for Mono (1.4 MB) Downloads: **708** of **99755**

Application can be easily extended based on your needs. Built-in Extensions Manager tool allows to get access to hundreds official and third-party resources of the following types: usage examples, plug-ins, SMath Viewer based applications, snippets, interface translations, interactive books, handbooks and tutorials.

> *Excelente software para cálculo. La interface tipo papel la hace muy versátil y amigable. La recomiendo ampliamente.* more...
>
> by Tomás Soto

> *If you are thinking about getting MathCAD for your business or personal use you may want to try SMath Studio first. SMath Studio is a free math program with easy to use intuitive "paper-like" interface. If SMatl* more...
>
> by j_kris

> *beautiful* more...
>
> by michele

Related resources

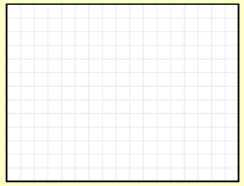
www.coolprop.org/coolprop/wrappers/... - CoolProp in SMath
en.wikipedia.org/wiki/SMath_Studio - Wikipedia article
iopscience.iop.org/chapter/978-1-6270... - Book: SMath for Physics
www.walkingrandomly.com/?p=2470 - Article on Walking Randomly #2
www.walkingrandomly.com/?p=1676 - Article on Walking Randomly #1
chrome.google.com/webstore/detail/s... - App in Chrome Web Store

Andrey Ivashov © 2006-2020 (на русском) | Privacy policy

Welcome to SMath Studio in the Cloud

Create

Create new worksheet form scratch or upload already existing document to put it into SMath Cloud. You can start editing worksheet immediately after it is created and continue working from any other place using generated link (using your account).



Blank worksheet

Upload file

The following file formats are supported:*.sm,*.smz,*.xmcd.

Recent

Open worksheet you have previously created inside SMath Cloud. To use this feature you should be logged in.

Please log in or register.

Search

Examples (40)

Try examples created by members of SMath community to see different features provided by application. Opened documents can be easily edited in order to test them or use with your own input data.

Steam engine

Oscillating cylinder steam engine

by Fridel Selitsky

Расчёт трубобетонной колонны

by Андрей Ивашов, Кирилл Николаев

Expansion of function to Maclaurin series

Expansion of the user-defined function to Maclaurin series with a custom degree.

by Radovan Omorjan

Arabic to Roman numeral conversion

Algorithm for conversion Arabic numerals to Roman numerals. User specifies a number using Arabic digits. Program shows a result of conversion in Roman numerals form.

by Andrey Ivashov, Fred Swartz

Beam FEA with interactive preprocessor

2D horizontal beam finite element analysis with

Search

Andrey Ivashov © 2006-2020 (на русском) | Privacy policy

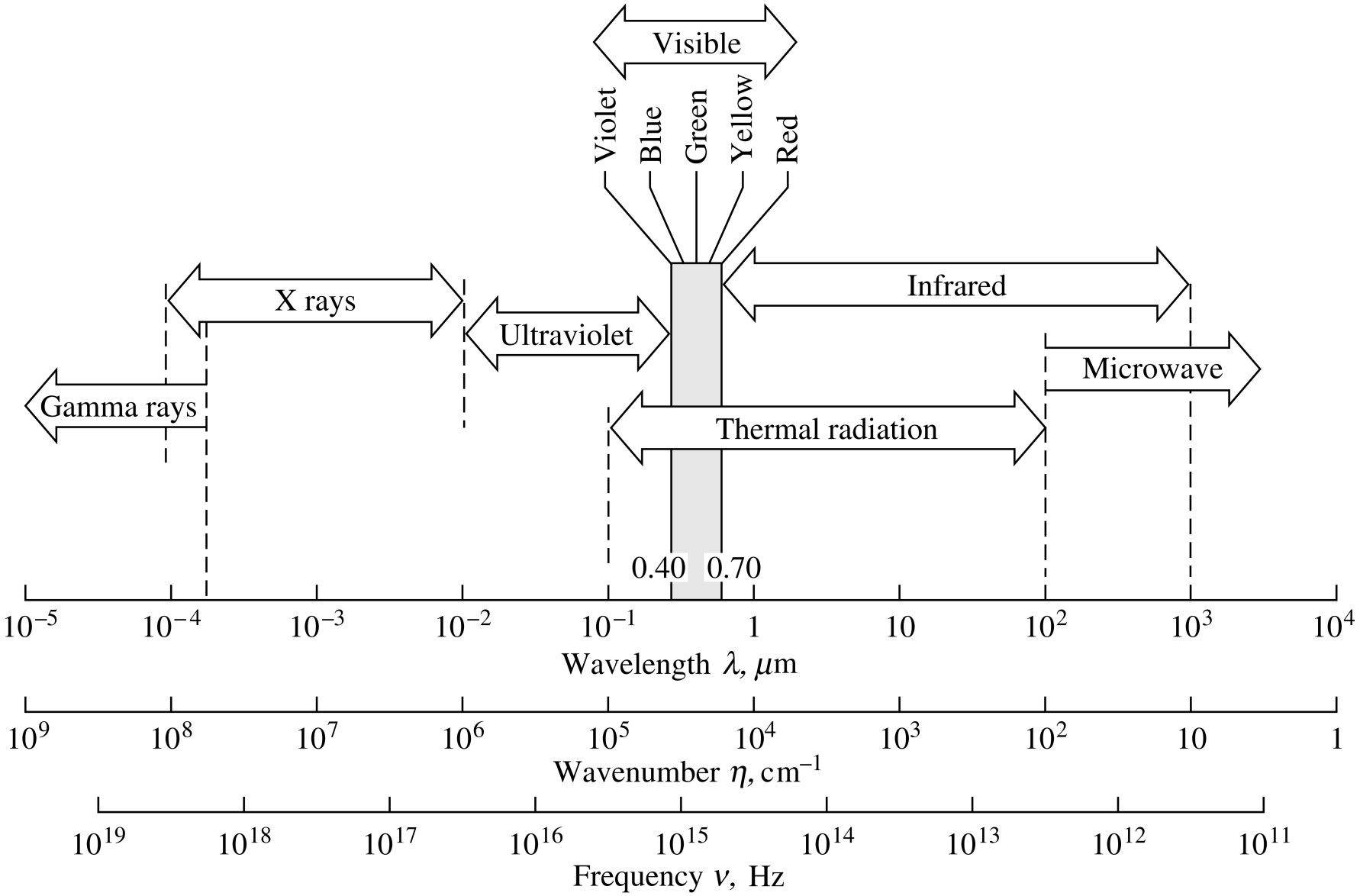
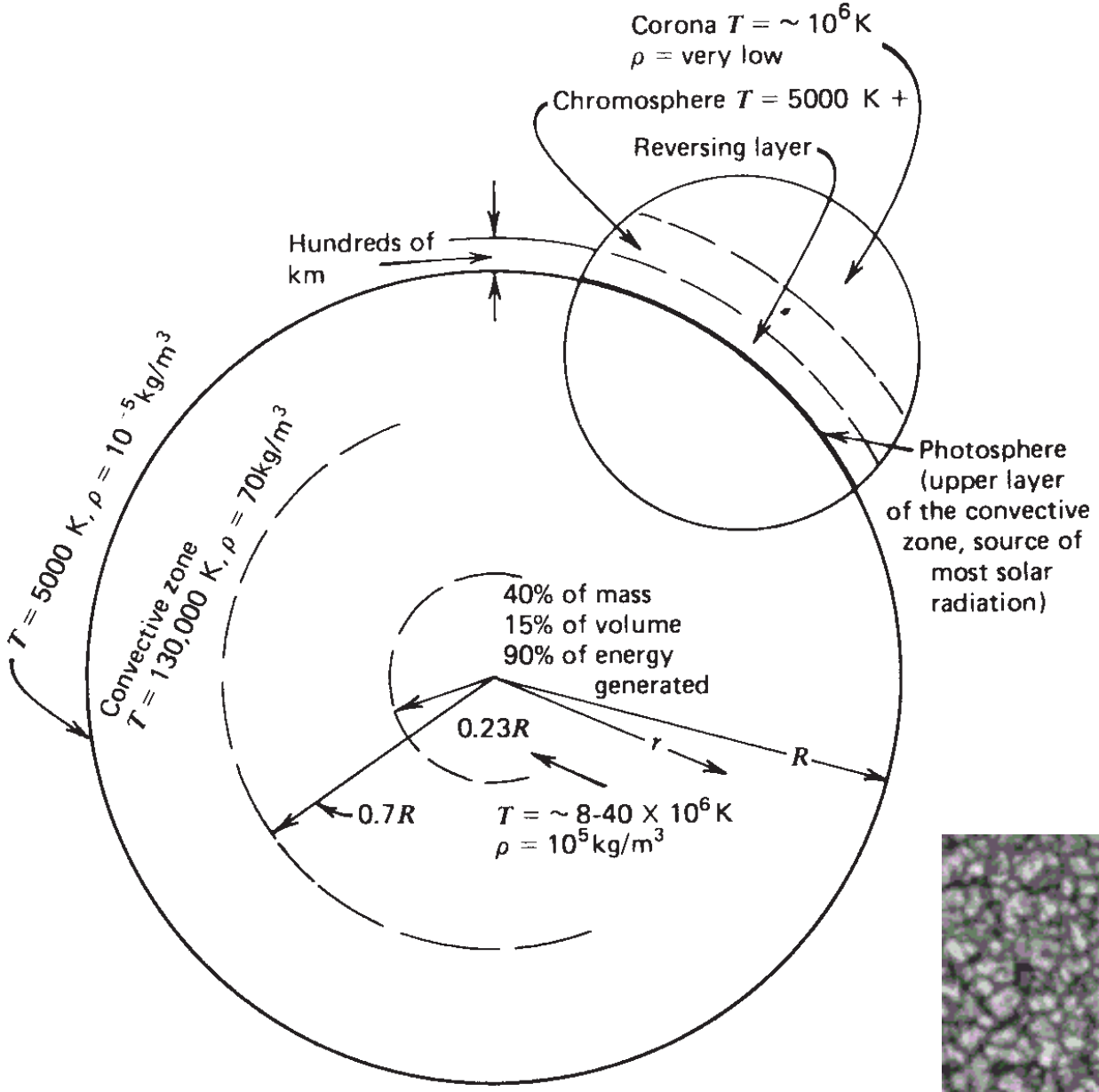
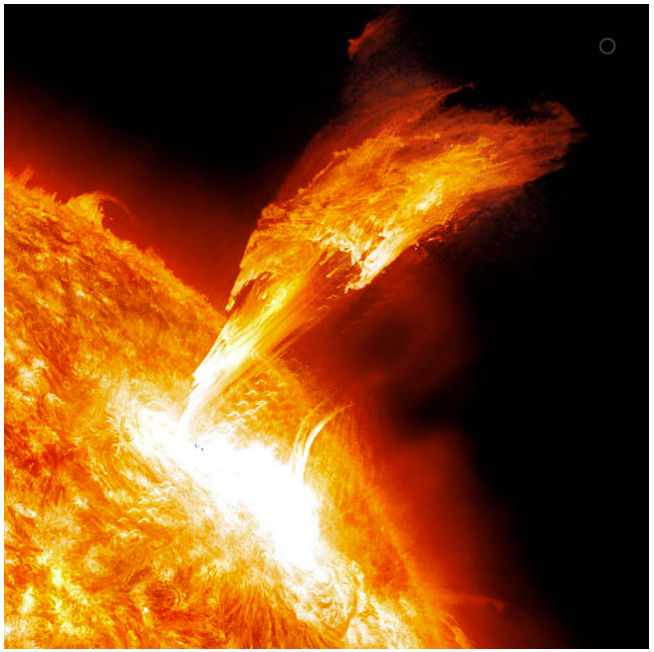
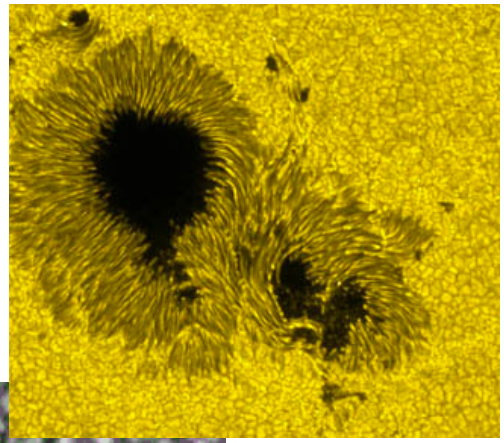


FIGURE 1-1
Electromagnetic wave spectrum (for radiation traveling through vacuum, $n = 1$).







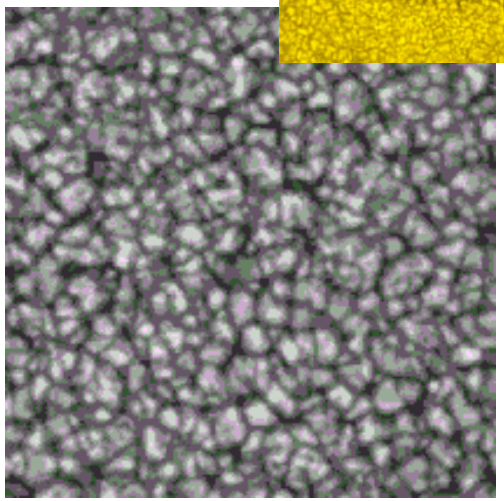


Figure 1.1.1 The structure of the sun.

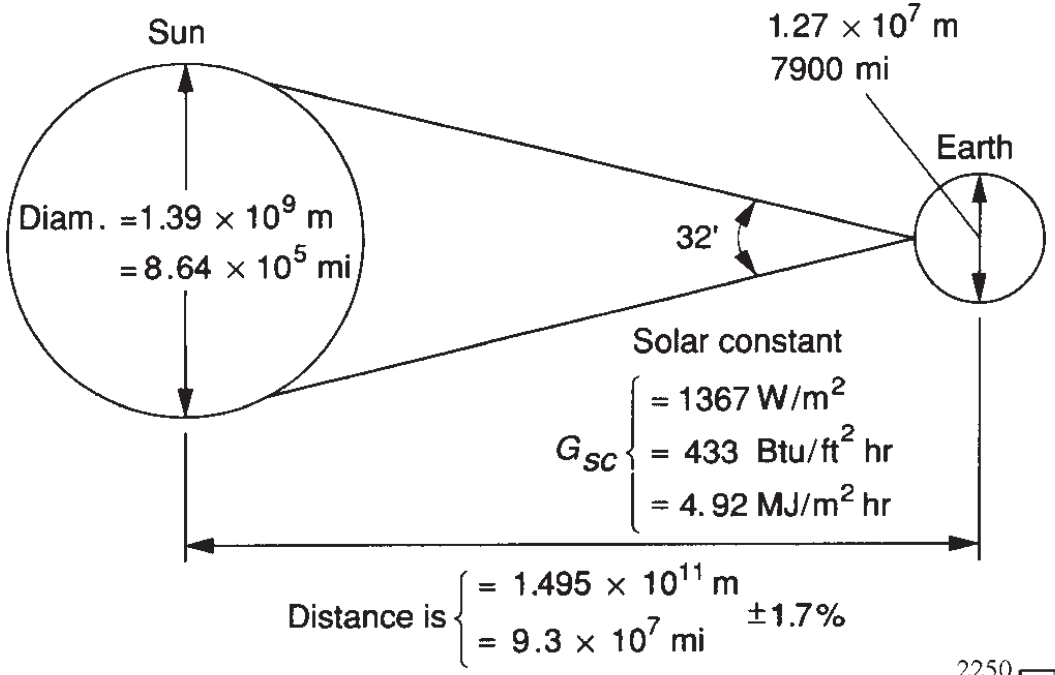


Figure 1.2.1 Sun-earth relationships.

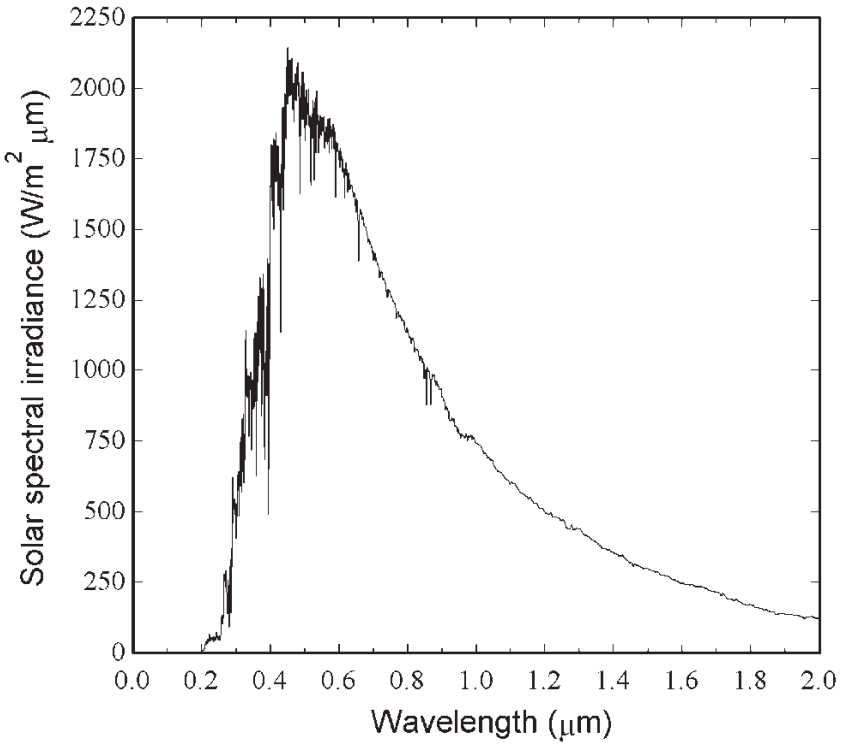


Figure 1.3.1 The WRC standard spectral irradiance curve at mean earth-sun distance.