

# Gautam Buddha University; Greater Noida

## School of Engineering (Mechanical Engineering)

Degree	Course Name	Course Code	Marks:100
M. Tech. in Thermal Engg.	Solar Energy	MET 514	SM+MT+ET  25+25+50
Semester	Credits	L-T-P	Exam
II	3	3-0-0	3 Hours

### Unit – I

**Introduction:** Solar energy option; specialty and potential; Sun - earth – Solar radiation; Beam and diffuse measurement; Estimation of average solar radiation on horizontal and tilted surfaces; Problems; Applications. **(07 Hours)**

### Unit – II

**Capturing Solar Radiation:** Physical principles of collection; Types; Liquid flat plate collectors; Construction details; Performance analysis; Concentrating collection; Flat plate collectors with plane reflectors; Cylindrical parabolic collectors; Orientation and tracking; Performance analysis. **(08 Hours)**

### Unit – III

**Power Generation:** Solar central receiver system; Heliostats and receiver; Heat transport system; Solar distributed receiver system; Power cycles; Working fluids and prime movers. **(07 Hours)**

### Unit – IV

**Thermal Energy Storage:** Introduction; Need; Methods of sensible heat storage using solids and liquids; Packed bed storage; Latent heat storage; Working principle; Construction; Application and limitations; Other solar Devices: stills; Air heaters; Dryers; Solar ponds & solar refrigeration.

**(08 Hours)**

## **Unit – V**

**Direct Energy Conversion:** Introduction; Conversion from solid; state principles; semiconductors; Solar cells; Energy Conversion: performance; Factor; Modular construction; Applications. **(08 Hours)**

## **Unit – VI**

**Economics:** Principles of Economics Analysis; Discounted cash flow; Solar system; Life cycle costs; Cost benefit analysis and optimization; Cost based analysis of water heating and photo voltaic applications. **(07 Hours)**

### **Recommended Books:**

1. Principles of Solar Engineering; Kreith and Keride; Taylor & Francis;
2. Solar Engineering of Thermal Processes; Duffie & Beckman; John Wiley and sons; 4<sup>th</sup> Edition; 2013.
3. Solar Energy; S.P. Sukhatme; Tata McGraw Hill; 1<sup>st</sup> Edition; 2008.
4. Solar Energy: Fundamental and Applications; Garg and Prakash; 1<sup>st</sup> Editions; Tata McGraw Hill; 2006.
5. Solar Power Engineering; B. S. Magal; 1<sup>st</sup> Editions; Tata McGraw Hill; 1990.
6. Solar Energy Conversion: The Solar Cell; R.C. Neville; Elsevier; 2<sup>nd</sup> Edition; 1995.