

# OPEN ELECTIVES COURSES

offered for

## B. Tech. Programmes (2018 – Scheme)

Approved by faculty for implementation  
wef 2018 onwards batch  
YPL  
18/7/19



GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY, HISAR  
(Established by State Legislature Act 17 of 1995)  
'A' Grade, NAAC Accredited State Govt. University

Acad./AC-III/Fac-1 Vol.3/2019/ 4199  
Dated: 20/8/19

To

The Controller of Examinations  
GJUS&T, Hisar.

**Sub: Approval of scheme of examination & syllabi of various B.Tech. programme(s) being run in University Teaching Departments as well as affiliated Engineering College(s)/Institute(s).**

AND

**Recommendations of Faculty of Engineering & Technology regarding Open Elective, Format of Minor Question Paper, MOOC Courses, minimum strength for Programme Elective, Semester Registration etc.**

Sir,

I am directed to inform you that the Vice-Chancellor, on the recommendations of the Faculty of Engineering & Technology, vide resolutions no. 2 to 13 in its meeting held on 18.07.2019, is pleased to approve the following scheme & syllabi of B.Tech. programme(s) w.e.f. the academic session / batch mentioned against each being run in University Teaching Departments as well as affiliated colleges/institutions and recommendations of Faculty of Engineering & Technology, regarding Open Elective, format of Minor Question Paper, MOOC Courses, minimum strength for Programme Elective, Semester Registration etc. under Section 11(5) in anticipation of approval of the Academic Council of the University Act. 1995:-

1. B.Tech. (Printing Technology), B.Tech (Packaging Technology) & B.Tech. (Printing & Packaging Technology)-4th year for University Teaching Departments and affiliated colleges for 2016-17 batch onwards.
2. B.Tech. (Printing & Packaging Technology) (Part-time)-3rd & 4th year for affiliated colleges for 2017-18 batch onwards.
3. B.Tech. (CSE) & B.Tech (IT)-2nd to 4th year for University Teaching Departments and affiliated colleges for 2018-19 onwards batch.
4. B.Tech. (ECE)- 2nd to 4th year for University Teaching Departments and affiliated colleges for 2018-19 onwards batch.
5. B.Tech. (EE)- 2nd to 4th year for University Teaching Departments and affiliated colleges for 2018-19 onwards batch.

Condt..p2/-

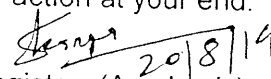
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6. B.Tech. (Printing Technology), B.Tech (Packaging Technology) & B.Tech. (Printing & Packaging Technology)-- 2nd to 4th year and syllabi of 2nd year only for University Teaching Departments and affiliated colleges for 2018-19 onwards batch.
7. B.Tech. (Agricultural Engg.) & B.Tech (Aeronautical Engineering)- 2nd to 4th year for affiliated colleges for 2018-19 onwards batch.
8. Scheme and syllabi of B.Tech. (Mechanical Engineering)- 2nd to 4th year for University Teaching Departments and affiliated colleges for 2018-19 onwards batch.
9. B.Tech. (Civil Engg.)- 2nd to 4th year for University Teaching Departments and affiliated colleges for 2018-19 onwards batch.
10. B.Tech. (Food Technology) 2<sup>nd</sup> to 4th year for University Teaching Departments for 2018-19 onwards batch.
11. The list and syllabus of Open Electives and Mandatory programmes for B.Tech. courses w.e.f. 2018-19 batch onwards.
12. The format of Minor Question paper for students of 2018-19 batch onwards (B.Tech 2nd to Final Year) and level of Assignment in light of Outcome based Education.
13. The students of B.Tech 2018-19 batch (2nd to Final year) will have choice to opt for MOOC course (not more than one in each semester) which he/she had not studied earlier, in lieu of Courses mentioned in every Programme Electives of equal credit with the prior approval of Chairperson within 15 days of start of semester.
14. The minimum 30% of existing class strength should opt for any Programme elective. Decimal part will be truncated in case 30% is not whole number .
15. The Semester Registration process being followed in FET. Faculty appreciated the process of Semester Registration in FET as it has helped in timely start of classes and has improved attendance in classes. Faculty further recommended that student should not be allowed to register after passage of one month of start of classes.

A copy of the scheme and syllabi of aforementioned B.Tech. programmes and other recommendations of Faculty of Engineering and Technology are enclosed herewith.

This is for your information and further necessary action at your end.

DA: As above

  
Deputy Registrar (Academic)  
For Registrar

Endst. No.Acad./ AC-III//Fac-1 Vol.3/ 4200-4211 Dated: 20/8/19

A copy of the above is forwarded to the following for information and necessary action:-

1. Dean Academic Affairs, GJUS&T, Hisar.
2. Dean of Colleges, GJUS&T, Hisar.

3. Dean, Faculty of Engg. & Technology, GJUS&T, Hisar (along with copy of scheme & syllabi of B.Tech. (Agricultural Engg.) & B.Tech (Aeronautical Engineering) 2nd to 4th year) and other recommendations from sr. no. 11 to 15. Further, he is requested to get upload the syllabi of above said programme on the website of the University.
4. Chairperson, Department of CSE, GJUS&T, Hisar (alongwith copy of scheme & syllabi of B.Tech. (CSE) & B.Tech (IT)-- 2nd to 4th year and other recommendations from sr. no. 11 to 15. Further, he is requested to get upload the syllabi of above said programme on the website of the University.
5. Chairperson, Department of Food Tech., GJUS&T, Hisar (alongwith copy of scheme & syllabi of B.Tech. (Food Technology) 2nd to 4th year and other recommendations from sr. no. 11 to 15. Further, she is requested to get upload the syllabi of above said programme on the website of the University.
6. Chairperson, Department of Mech. Engg., GJUS&T, Hisar (alongwith copy of scheme & syllabi of B.Tech. (Mechanical Engineering) 2nd to 4th year and other recommendations from sr. no. 11 to 15 . Further, he is requested to get upload the syllabi of above said programme on the website of the University.
7. Chairperson, Department of Environmental Science & Engineering, GJUS&T, Hisar (alongwith copy of scheme & syllabi of B.Tech. (Civil Engg.) 2nd to 4th year and other recommendations from sr. no. 11 to 15. Further, he is requested to get upload the syllabi of above said programme on the website of the University.
8. Chairperson, Department of Electronics & Communication Engineering GJUS&T, Hisar (alongwith copy of scheme & syllabi of B.Tech. (ECE) 2nd to 4th year and B.Tech. (EE) 2nd to 4th year and other recommendations from sr. no. 11 to 15. Further, he is requested to get upload the syllabi of above said programme on the website of the University.
9. Chairperson, Department of Printing Tech., GJUS&T, Hisar (alongwith copy of scheme & syllabi of B.Tech. (Printing Technology), B.Tech (Packaging Technology) & B.Tech. (Printing & Packaging Technology)- 4th year, B.Tech. (Printing & Packaging Technology) (Part-time) 3rd & 4th year and Scheme of examination -- 2nd to 4th year and syllabi – 2nd year of B.Tech. (Printing Technology), B.Tech (Packaging Technology) & B.Tech. (Printing & Packaging Technology) and other recommendations from sr. no. 11 to 15. Further, he is requested to get upload the syllabi of above said programme on the website of the University.
10. Director-Principal, Manav Institute of Tech. & Mgt., Village- Jevra, alongwith copy of scheme & syllabi of B.Tech. (CSE), (ECE), (ME), (Civil Engg.), (EE), (Aeronautical Engg.) and (Agriculture Engg.) programmes and other recommendations from sr. no. 11 to 15.
11. Director-Principal, Om Institute of Tech. & Mgt., Juglan alongwith copy of scheme & syllabi of B.Tech. (CSE), (IT), (ME), (ECE), (Civil Engg.), (Printing & Packaging Technology), (Printing & Packaging Technology) – Part Time (EE), programmes and other recommendations from sr. no. 11 to 15.

  
 Deputy Registrar (Academic)  
 for Registrar



# Open Elective Courses offered for various B. Tech. Programmes

(2018 Scheme)

## Open Elective Course - I for B. Tech. 5<sup>th</sup> Semester

S. No.	Course Code	Course Nomenclature	Offered By	Credits
1	OE-PTG-391-T	Fundamentals of Printing	Printing Technology	3
2	OE-ME-391-T	Industrial Engineering	Mechanical Engineering	3
3	OE-CSE-391-T	Information and Cyber Security	Computer Science & Engineering	3
4	OE-ECE-391-T	Principles of Digital Electronics	Electronics & Communication Engineering	3
5	OE-FT-391-T	Processing and Preservation of Foods	Food Technology	3
6	OE-CE-391-T	Introduction to Civil Engineering	Civil Engineering	3
7	OE-EE-391-T	Utilization of Electrical Energy	Electrical Engineering	3

## Open Elective Course - II for B. Tech. 6<sup>th</sup> Semester

S. No.	Course Code	Course Nomenclature	Offered By	Credits
1	OE-PTG-392-T	Graphics Design Fundamentals	Printing Technology	3
2	OE-ME-392-T	Solar Energy Engineering	Mechanical Engineering	3
3	OE-CSE-392-T	Introduction to Soft Computing	Computer Science & Engineering	3
4	OE-ECE-392-T	Fundamentals of Communication Systems	Electronics & Communication Engineering	3
5	OE-FT-392-T	Food Safety, Quality and Regulations	Food Technology	3
6	OE-CE-392-T	Introduction to Fluid Mechanics	Civil Engineering	3
7	OE-EE-392-T	Renewable Energy Resources	Electrical Engineering	3

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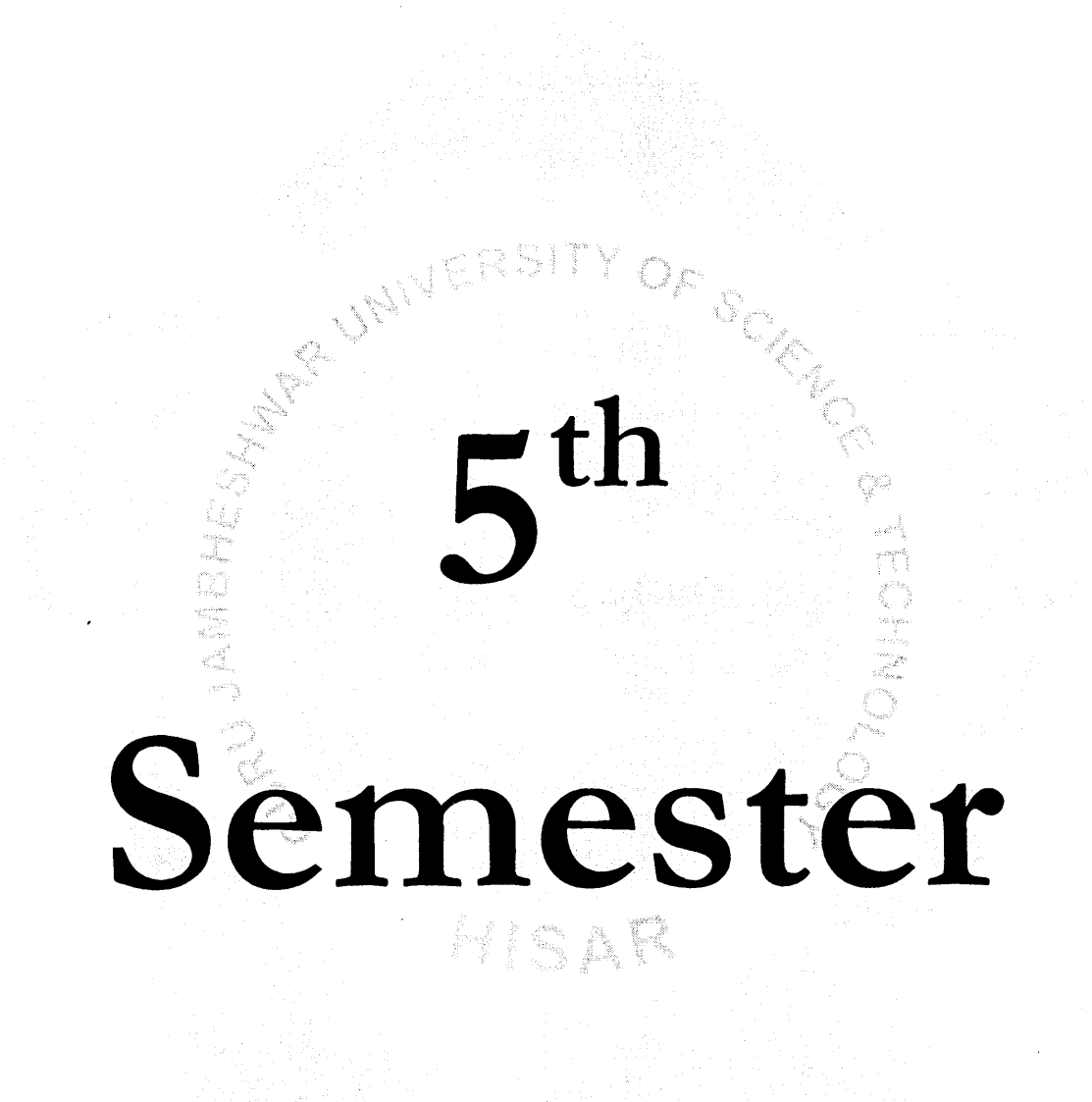
### Open Elective Course - III for B. Tech. 7<sup>th</sup> Semester

S. No.	Course Code	Course Nomenclature	Offered By	Credits
1	OE-PTG-491-T	Fundamentals of Packaging	Printing Technology	3
2	OE-ME-491-T	Computer Aided Design and Manufacturing	Mechanical Engineering	3
3	OE-CSE-491-T	Statistical Computing	Computer Science & Engineering	3
4	OE-ECE-491-T	Introduction to MATLAB and Simulink	Electronics & Communication Engineering	3
5	OE-FT-491-T	Instrumental Analysis of Foods	Food Technology	3
6	OE-CE-491-T	Environmental Engineering	Civil Engineering	3
7	OE-EE-491-T	Energy Management and Audit	Electrical Engineering	3

*Note: Student can opt for any open electives other than open Elective offered by his/her own department.*

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**5<sup>th</sup>**  
**Semester**

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# FUNDAMENTALS OF PRINTING

(Students from Department of Printing Technology cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-PTG-391-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	
Mode: Lectures	
Examination Duration: 3 Hours	
For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.	

## UNIT-I

**History:** Brief history of Printing across the Globe, Evolution of Printing processes and methods from a craft to the present day as a sophisticated technology. **Basic operations in printing:** Pre press, press and post press operations.

**Introduction to Major Printing Processes:** Basic principles, characteristics, identification and applications of Letterpress, Flexography, Lithography and Offset, Gravure, Screen printing etc. Modes of taking impressions for major printing processes, Comparison of major printing processes

## UNIT-II

**Letterpress Printing :** Introduction to Letterpress Printing, General Principles, Characteristics, identification, advantages, limitations and applications of Letterpress Printing, classification of Letterpress Printing Machines. Types of Letterpress Printing Machine - Platen, Cylinder and Rotary machines; their mechanical and operational features and their uses; merits and demerits.

**Offset Printing :** Introduction to Lithography Printing, Introduction to Offset Printing, General principles, characteristics, identification, advantages, limitations and applications of Offset Printing, classification of Offset Printing Machines. Types of Offset Printing Machines- Sheet fed, Web Fed and its types, their mechanical and operational features

## UNIT-III

**Gravure Printing:** Introduction to Intaglio Printing, Introduction to Gravure Printing, General principles, characteristics, identification, advantages, limitations and applications of Gravure printing, classification of Gravure printing machines.

**Screen Printing:** Introduction to Screen Printing, general principles, characteristics, identification, advantages, limitations and applications of Screen Printing.



**Digital Printing:** Introduction to Digital Printing, general principles, characteristics, identification, advantages, limitations and applications of Digital Printing, classification of Digital Printing machines.

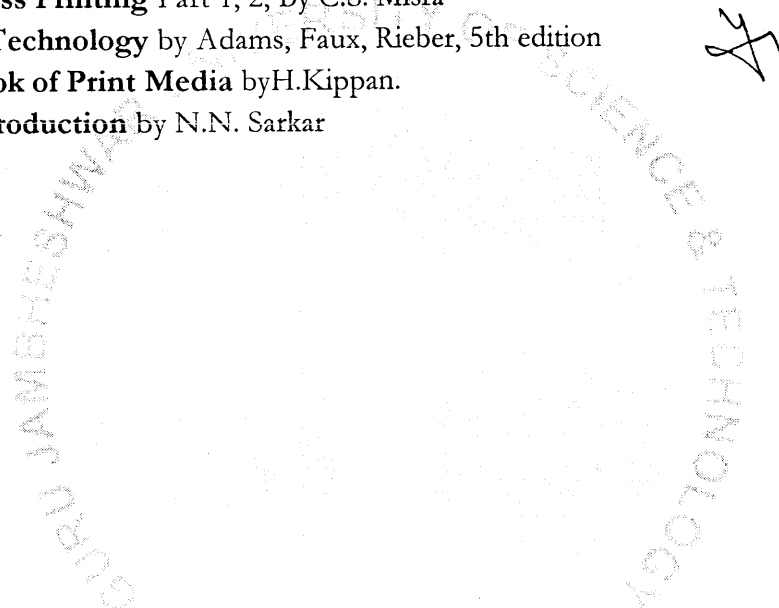
#### UNIT-IV

**Flexography Printing:** Introduction to Flexography Printing, Mechanical principles of flexography - Fountain roll, Anilox roll, plate cylinder, impression cylinder. Anilox roll - construction, cell structure, Anilox roll wear, selecting the right anilox roll, chrome plating.

**Common Running Defects of Printing:** Common printing faults, causes and their remedies, Basic requirements for process Colour Printing, **Understanding Colour:** Dimensions of colour, Colour theory, Primary colours, Secondary colours, Additive Colour and Subtractive Colour, Colour schemes, Colour symbolism and emotional effects of colour.

#### Text & Reference Books:

1. **Letter Press Printing** Part 1, 2, By C.S. Misra
2. **Printing Technology** by Adams, Faux, Rieber, 5th edition
3. **Hand Book of Print Media** by H. Kippan.
4. **Art and Production** by N.N. Sarkar



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# INDUSTRIAL ENGINEERING

(Students from Department of Mechanical Engineering cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-ME-391-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.  For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT-I

**Plant Layout:** Objectives of Good Plant Layout, Importance of Plant Layout, Types of Plant Layout, Advantages and Limitations of Different Types of Plant Layouts

**Material Handling:** Function of Material Handling, Principles of Material Handling, Material Handling Devices, Relation between Plant Layout and Material Handling

## UNIT-II

**Work Study:** Definition and Concept of Work Study, Need of Work Study, Advantages of Work Study, Techniques of Work Study, Work Study and Management, Work Study and Productivity

**Method Study:** Objectives and Procedure of Method Study, Process Chart Symbols, Flow Diagram, String Diagram, Therblig, Multiactivity Charts

## UNIT-III

**Work Measurement:** Objectives of Work Measurement, Basic Procedure for Time Study, Difference between Time Study and Motion Study, Various Time Estimates and Production Standard, Level of Performances, Allowances, Various Time Recording Techniques in Time Study

**Value Engineering:** Types of Values, Concept of Value Engineering, Phases of Value Engineering Studies, Application of Value Engineering

## UNIT-IV

**Ergonomics:** Concept of Ergonomics, Objectives of Ergonomics, Man Machine System Interface, Anthropometry, Ergonomics and Safety, Ergonomics and Fatigue

**Intellectual Property Rights:** Intellectual Property Rights, Patents, Trade Marks, CopyRights,  
Law of Contract

**Text and Reference Books:**

1. Industrial Engineering and Management by Hicks, Tata McGraw Hill, New Delhi
2. Work study and Ergonomics by Suresh Dalela and Saurabh, Standard Publishers
3. Motion and time study by R. Bernes, John-Wiley & Sons
4. Ergonomics at work by D.J. Osborne, John Wiley & Sons
5. Techniques of Value Analysis and Engineering by Miles, McGraw Hill



# INFORMATION AND CYBER SECURITY

(Students from Department of CSE cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-CSE-391-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT-I

**Cryptography:** Overview of information security, Basic concepts, Cryptosystems, Cryptoanalysis, Ciphers & Cipher modes, Symmetric key Cryptography DES, AES asymmetric key cryptography, RSA algorithm, Key management protocols, Diffie Hellman algorithm. Digital signature, Public Key Infrastructure.

## UNIT-II

**System Security:** Program security, Security problems in coding, Malicious logic, Protection. Database Security- Access controls, Security & integrity threats, Defense mechanisms. OS security-protection of system resources, Models for OS security, Net Security-User based security, Code access security, form authentication.

## UNIT-III

**Ethics in Cyber Security:** Privacy, Intellectual property in the cyberspace, Professional ethics, Freedom of speech, Fair user and ethical hacking, Trademarks, Internet fraud, Electronic evidence, Forensic technologies, Digital evidence collections. Tools and methods used in cybercrime: Introduction, Password cracking, Keyloggers and spywares, Virus and worms, Phishing and identity theft, Trojan horses and backdoors, Steganography

## UNIT - IV

**Cybercrimes and Cybersecurity:** Cybercrime and legal landscape around the world, Cyberlaws, The Indian IT Act, Challenges, Digital signatures and Indian IT Act, Amendments to the Indian IT Act, Cybercrime and punishment, Cost of Cybercrimes and IPR Issues, Web threats for organizations, Social computing and associated challenges for organizations.



**Text and Reference Books:**

1. William Stallings, *Cryptography and Network security-Principles and Practices*, Pearson Education, Ninth Indian Reprint 2005.
2. Charlie Kaufman, *Network Security: Private communication in Public World*, Prentice-Hall International, Inc. April 2008
3. Nina Godhole and SunitBelapure, *Cyber Security*, Wiley India, 2011.
4. James Graham, Ryan Olson, Rick Howard, *Cyber Security Essentials*, CRC Press, Taylor & Francis, 2011.

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# PRINCIPLES OF DIGITAL ELECTRONICS

(Students from Department of ECE cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-ECE-391-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.  For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT-I

**DIGITAL FUNDAMENTALS: Number Systems** – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, **Codes** – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems. **Logic gates:** Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization.

## UNIT-II

**COMBINATIONAL CIRCUIT DESIGN** :Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder.

## UNIT-III

**SYNCHRONOUS SEQUENTIAL CIRCUITS: Flip flops** – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, conversion of FF. **Design of Counters-** Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

## UNIT-IV

**MEMORY DEVICES AND DIGITAL INTEGRATED CIRCUITS: Basic memory structure** – ROM ,PROM, EPROM, EEPROM, EAPROM, RAM, Static and dynamic RAM. **Programmable Logic Devices:** Programmable Logic Array (PLA), Programmable Array Logic (PAL), Field Programmable Gate Arrays (FPGA). **Digital Logic Families:** Logic levels, propagation delay, power dissipation, fan-out and fan-in, noise margin, RTL, TTL, ECL, CMOS.

### Text Books:

- 1 Modern Digital Electronics(Edition III) : R. P. Jain; TMH

- 2 Digital Fundamentals : Thomas L Floyd
- 3 Digital circuits and design : S. Salivahanan, and S. Arivazhagan

**Reference Books:**

- 1 Digital Integrated Electronics: Taub & Schilling; MGH
- 2 Digital Principles and Applications: Malvino & Leach; McGraw Hill.
- 3 Digital Design: Morris Mano; PHI.

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# PROCESSING AND PRESERVATION OF FOODS

(Students from Department of Food Technology cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-FT-391-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT- I

Sources of food, scope and benefit of industrial food preservation, perishable, non-perishable food, causes of food spoilage. Microbial growth curve and general principle of preservation. Preservation factors.

## UNIT -II

Thermal processing methods of preservation – Principle and equipment: Canning, blanching, pasteurization, sterilization, evaporation. Use of low temperature – Principle, equipment and effect on quality. Chilling, cold storage, freezing.

## UNIT -III

Preservation by drying dehydration and concentration – Principle, Methods, Equipment and effect on quality :Difference, importance of drying & dehydration over other methods of drying and dehydration, equipments and machineries, physical and chemical changes in food during drying and dehydration .Need and Principle of concentration, methods of concentration – Thermal concentration, Freeze concentration, membrane concentration, changes in food quality by concentration.

## UNIT- IV

Preservation by radiation, chemicals & preservatives. Definition, Methods of Irradiation, Direct & Indirect effect, measurement of radiation dose, dose distribution, effect on microorganisms. Deterioration of Irradiated foods physical, chemical and biological; effects on quality of foods. Preservation of foods by chemicals, antioxidants, mould inhibitors, antibodies, acidulates etc. Preservation by salt & sugar – Principle, Method, Equipment and effect on food quality. Recent methods in preservation: Pulsed electric field processing, High pressure processing, Processing



using ultrasound, dielectric, ohmic and infrared heating. Theory, equipments and effect on food quality.

### Recommended Readings

1. Norman N. Potter, Joseph H. Hotchkiss , Food Science – 5<sup>th</sup> ed. Springer, 1998 - Technology & Engineering - 608 pages
2. Giridhari Lal, G.S. Siddappa and G. L. Tandon, Preservation of Fruits and Vegetables; CFTRI, ICAR , New Delhi -12
3. MirceaEnachescuDauthy, 'Fruit and vegetable processing', FAO Agricultural Services Bulletin 119; International Book Distributing Co.
4. B J B Wood, Microbiology of Fermented Foods, Vol. I; Elsevier Applied Science Publishers.
5. Diane M Barrett, Laszlo Somogyi, HoshahalliRamaswamy, Processing Fruits, Science and Technology; CRC Press.
6. Marcus Karel, Owen R Fernnema, Physical principles Food Science, Part I and II; Marcel Dekker inc



# INTRODUCTION TO CIVIL ENGINEERING

(Students from Department of Civil Engineering cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-CE-391-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.  For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT - I

**Construction Materials: Stones** -Characteristics of good building stones-common building stones and their uses, **Bricks**-Characteristics of good bricks-classification of bricks and their uses, **Timber**: Classification of Timber and their uses-Cement-Types of cement and their uses

## UNIT - II

**Components of building**: Components of sub structure and their functions-Components of super structure and their functions -Types of forces – compression, tension, shear – Stress – Strain-Concrete- Ingredients of concrete and its importance in construction -Steel- Types of steel and its importance in construction

## UNIT - III

**Survey and Highway Engineering**: Definition and classification of surveying – linear and angular measurements – levelling, Modes of transportation – Classification of highways - Classification of pavements – Super elevation.

## UNIT - IV

**Irrigation and Water supply**: Definition and classification of irrigation – Irrigation structures – dams, weirs, cross drainage works, canal drops-Quality of water-Treatment methods, **Geotechnical Engineering**: Origin of soil – types of soil – bearing capacity of soil – Types of foundation – shallow and deep

## Recommended Readings

1. B C Punmia, Ashok K Jain, Arun K Jain, (1st Edition, 2003), “Basic Civil Engineering”, Laxmi Publications (P) Ltd.
2. G K Hiraskar, (1st Edition, 2004), “Basic Civil Engineering”, Dhanpat Rai Publication

## UTILIZATION OF ELECTRICAL ENERGY

(Students from Department of Electrical Engineering cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-EE-391-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Mode: Lectures	
Examination Duration: 3 Hours	

### UNIT – I

**Illumination and Refrigeration:** Illumination – Terminology, Laws of illumination, Photometry, lighting calculations. Electric lamps – Different types of lamps, LED lighting and Energy efficient lamps, Design of lighting schemes – factory lighting, flood lighting, street lighting. Refrigeration-Domestic refrigerator and water coolers, Air –Conditioning, Various types of air conditioning system and their applications, smart air conditioning units

### UNIT – II

**Domestic utilization of electrical energy:** House wiring, Induction based appliances, Online and OFF line UPS, Batteries, Power quality aspects, nonlinear and domestic loads, Earthing; domestic, industrial and sub-station. Energy Efficient motors: Standard motor efficiency, need for more efficient motors, Motor life cycle, direct savings and payback analysis, efficiency evaluation factor.

### UNIT - III

**Electric Heating and Electrolytic Processes:** Types of heating and applications, Electric furnaces - Resistance, Inductance and Arc Furnaces, Electric welding and sources of welding, Electrolytic Processes: Definition of various terms used in Electrolysis, Faradays' laws of Electrolysis, Extraction of Metals, Refining of metals, Electro-Deposition, Power Supply for Electrolytic Processes.

### UNIT – IV

**Traction system** –Requirement of an ideal traction system, power supply, traction drives, electric braking, Train movement (speed time curve, simplified speed time curve, average speed and schedule speed), Electric traction motors & their control, Speed control and braking, recent trend in electric traction.

### Recommended Readings

1. R. K. Rajput., Utilization of Electrical Power', Laxmi Publications, 1<sup>st</sup> edition, 2006.

2. S.L. Uppal and S. Rao, 'Electrical Power Systems', Khanna Publishers, New Delhi, 15th Edition, 2014.
3. J. B. Gupta, Utilization of Electrical Energy and Electric Traction, S. K. Kataria and Sons, 10<sup>th</sup> edition, 2012.
4. N. V. Suryanarayana, Utilization of Electrical Power, New Age International Publishers, reprinted 2005.
5. C. L. Wadhwa, Generation Distribution and Utilization of Electrical Energy, New Age International Publishers, 4<sup>th</sup> edition, 2011.
6. H. Partab, Modern Electric Traction, Dhanpat Rai & Co., 3<sup>rd</sup> edition, 2012.
7. Energy Efficiency in Electrical Utilities, BEE Guide Book, 2010.

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GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY  
HISAR

6<sup>th</sup>

Semester

GURU JAMBHESHWAR

UNIVERSITY OF SCIENCE & TECHNOLOGY

HISAR

## GRAPHIC DESIGN FUNDAMENTALS

(Students from Department of Printing Technology cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-PTG-392-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	
Mode: Lectures	
Examination Duration: 3 Hours	
For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.	

### UNIT-I

**Introduction to Graphic Design:** Introduction to design, introduction to Graphic Design, Introduction to Printer's design, Concept of Graphic Arts, Concept of Graphic Communications, Understanding steps involve in Graphic Communications and Making the Print work. **Fundamentals of Design:** Point, Line, Shape, Tone, value, weight, texture, size, space, etc. **Principles of Design:** Balances, Proportion, Rhythm, Unity, Contrast, Simplicity, Fitness.

### UNIT-II

**Colours in Package Design:** Introduction of Colour, function of Colour, Physical Dimension of Colour, Responses to Colour, emotional effects of colour. Colour Combination - Colour schemes, Dimension of colour, colour symbolism, Colour Theory- Additive theory, Subtractive theory. Division of Design -Natural, Conventional, Decorative, Geometrical and abstract.

**Typography :** Typography -Structure Design and Function, Introduction to 2D & 3D Types, Physical structure of type, type measurement, Introduction to Digital Types, Post Script Fonts, True Type Fonts, Open Type Fonts, Methods of type arrangement, classification of typeface of font designing.

### UNIT-III

**Introduction to Type Design :** Design style, Grouping of Type Faces, Type Families, Introduction to Indian Type Faces, Function of type Composition, Readability, Legibility, concept of Spacing- Letter Spacing, Word Spacing, Line Spacing, Paragraph Spacing.

**Print Planning of Package:** Introduction to Layout, Terms in Layout Planning, Stage of Layout Planning, Rough layout, comprehensive and artwork. Understanding of scale and sense of proportion. **ORIGINALS:** Introduction to originals, Type of originals, sizing, masking and cropping.

## UNIT-I

Examination Duration: 3 Hours

Examination Duration: 3 Hours

Setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

## UNIT-I

**Introduction to solar system:** Introduction, solar system – sun, earth and earth-sun angles, time, derived solar angles,

**Solar Radiation estimation** of solar radiation (direct and diffuse), measurement systems – pyrheliometers and other devices.

## UNIT-II

**Effect of Solar radiation upon structures:** Steady state heat transmission, solar radiation properties of surfaces, shading of surfaces, periodic heat transfer through walls and roofs.

**Solar Collectors:** Flat plate and concentrating – comparative study, design and materials, efficiency, selective coatings, heliostats.

## UNIT-III

**Heating Applications of Solar Energy:** Air and Water heating systems, thermal storages, solar bonds, solar pumps, solar lighting systems, solar cookers, solar drying of grains.

**Cooling Applications of Solar Systems:** Continuous and intermittent vapour absorption systems for cooling applications, absorbent – refrigerant combination, passive cooling systems.

## UNIT-IV

**Solar Electric Conversion Systems:** Photovoltaics, solar cells, satellite solar power systems. **Effects on Environment:** economic scenario, ozone layer depletion, greenhouse effect, global warming, Remedial measures by international bodies.

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# SOLAR ENERGY ENGINEERING

(Students from Department of Mechanical Engineering cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-ME-392-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.  For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT-I

**Introduction to solar system:** Introduction, solar system – sun, earth and earth-sun angles, time, derived solar angles,

**Solar Radiation** estimation of solar radiation (direct and diffuse), measurement systems – pyrheliometers and other devices.

## UNIT-II

**Effect of Solar radiation upon structures:** Steady state heat transmission, solar radiation properties of surfaces, shading of surfaces, periodic heat transfer through walls and roofs.

**Solar Collectors:** Flat plate and concentrating – comparative study, design and materials, efficiency, selective coatings, heliostats.

## UNIT-III

**Heating Applications of Solar Energy:** Air and Water heating systems, thermal storages, solar bonds, solar pumps, solar lighting systems, solar cookers, solar drying of grains.

**Cooling Applications of Solar Systems:** Continuous and intermittent vapour absorption systems for cooling applications, absorbent – refrigerant combination, passive cooling systems.

## UNIT-IV

**Solar Electric Conversion Systems:** Photovoltaics, solar cells, satellite solar power systems. **Effects on Environment:** economic scenario, ozone layer depletion, greenhouse effect, global warming, Remedial measures by international bodies.



**Text and Reference Books:**

1. Solar Energy: Fundamentals, Design, Modelling and Applications- GN Tiwari, CRC Press
2. Solar Energy – S P Sukhatme, Tata McGraw Hill
3. Solar Energy Process – Duffie and Bechman, John Wiley
4. Applied Solar Energy – Maniel and Maniel, Addison Wiley
5. Solar Energy: Fundamentals and Applications – R P Garg and Jai Prakash, TMH.

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GUPTA JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY  
HISAR

# FUNDAMENTALS OF COMMUNICATION SYSTEMS

(Students from Department of ECE cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-ECE-392-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.  For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT-I

**Introduction:** Introduction to Communication System, Terminologies in Communication Systems, Electromagnetic spectrum and typical application, concept of electrical communication, modes and media's of Communication, Elements of analog Communication system, Need for modulation.

## UNIT-II

**Amplitude Modulation:** Theory of AM: mathematical expression, waveforms, modulation index, types of AM; Generation of AM: Square law modulation, Switching modulator, , Balanced modulator.

## UNIT-III

**Frequency Modulation:** Theory of FM, mathematical expression, waveforms, modulation index; , Narrowband and Wideband FM, Comparison between AM and FM; Generation of FM: Direct Methods – Varactor diode modulator ; Indirect method – Armstrong FM system.

## UNIT-IV

**Digital modulation techniques:** Sampling theorem, ASK, FSK, PSK techniques theory, mathematical expressions and Block diagram of generation and degeneration.

### Text Books:

1. R.P. Singh, S.D. Sapre, "Communication Systems: Analog and Digital", 3rd Edition, McGraw Hill.
2. George Kennedy, Bernard Davis & SRM Prasanna, "Electronic Communication Systems", 5th Edition, McGraw Hill.
3. H.Taub, D.L. Schilling & G. Saha, "Principles of Communication Systems", 4<sup>th</sup> Edition, McGraw Hill.

**Reference Books:**

1. Couch: Digital and Analog Communication Systems, 6th Edition, Pearson Education.
2. Bernard Sklar: Digital Communication, 2nd Edition, Pearson Education.
3. Digital Communications by John G.Proakis; McGraw Hill.



**Text & Reference Books:**

1. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc GrawHill.R.S. Khandpur



# RENEWABLE ENERGY RESOURCES

(Students from Department of Electrical Engineering cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-EE-392-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT-I

**Introduction:** Over view of conventional & renewable energy sources, limitations of conventional energy sources, need & development of alternate energy sources, basic schemes and applications of direct energy conversion types of renewable energy systems, future of energy use, Global and Indian energy scenario, potential of renewable energy sources, Global climate change, CO<sub>2</sub> reduction potential of renewable energy

## UNIT-II

**Solar and Wind Energy:** Solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability, Photovoltaic effect, characteristics of photovoltaic cells, conversion efficiency, solar batteries and applications, Solar energy in India, solar collectors, solar furnaces & applications, History of wind power, wind generators, theory of wind power, characteristics of suitable wind power sites, scope in India, advantages and limitations.

## UNIT-III

**Thermo-electric and MHD Generators:** Seeback effect, Peltier effect, Thomson effect, thermoelectric convertors, brief description of the construction of thermoelectric generators, applications and economic aspects. Hall Effect, Basic principles of MHD generator different types of MHD generators, conversion effectiveness, Practical MHD generators, applications and economic aspects.

## UNIT-IV

**Fuel Cells and Miscellaneous Sources:** Principle of action, Gibbs free energy, general description of fuel cells, types, construction, operational characteristics and applications, Geo-thermal system, characteristics of geothermal resources, Low head hydro-plants.

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### Text & Reference Books:

1. G.D. Rai, Non-Conventional sources of Energy, Khanna Publishers, 2009
2. G. S. Sawhney, Non-Conventional Energy Resources, PHI Learning, 2012
3. B. H Khan., Non-Conventional Energy Resources, Tata McGraw Hill, 2009
4. R.A. Coobe, An Introduction to Direct Energy Conservation, Pitman, 1968
5. M. A. Kettani, Direct Energy Conversion, Addison-Wesley Educational Publishers Inc, 1970
6. Robert L. Loftness, Energy Hand book, Van Nostrand Reinhold, 1984
7. S. S. Rao, B. B. Parulekar, Energy Technology, Khanna Publishers, 1994
8. G. N. Tiwari and M. K. Ghosal, Renewable Energy Applications, Narosa Publications, 2004
9. S. A. Abbasi. and N. Abbasi, Renewable Energy Sources and their Environmental Impact, Prentice Hall of India, 2001



**7<sup>th</sup>**

**Semester**



# FUNDAMENTALS OF PACKAGING

(Students from Department of Printing Technology cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-PTG-491-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	
Mode: Lectures	
Examination Duration: 3 Hours	
For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.	

## UNIT-I

**Packaging Introduction:** Packaging – History, Need & Evolution of Packaging, Definition of Packaging. Packaging Functions – Contain, Preserve, Protect, Inform, Identify, Sell. Types of – Rigid/ Semi- Rigid/ Flexible, Package, Packaging Classifications – Primary / Secondary / Tertiary/ Unit / intermediate. Shelf Life of Package- Analysis and Evaluation. Markings on package - Handling marks, routing marks, information marks.

**Packaging HAZARDS:** Storage, Transportation, Chemical, Climatic, Biological. Packaging Classifications – Primary / Secondary / Tertiary / Unit / intermediate

## UNIT-II

**Package Design:** Design Fundamentals, Need for Changes in Package Design, Feature in Effective Design, Packaging Graphics and its importance, Package Colour and its importance. Graphic Design Elements – Significance of Shape, Size, Colour, Font, Texture, Lines, Balance & Unity, Symmetry & Harmony. Shelf Appeal Studies: Recall Questioning, Focus Group, Eye-Tracking, S-scope.

**Product-Package Compatibility Studies :** Product Characteristics: Physical (Nature, Shape, Size, Texture, Centre of gravity, etc.), Chemical (Acidic, basic, reactivity etc.), Biological (Effect of micro-organisms) and Package Characteristics: Material (Plastic, paper, wood, etc.), Physical (Tensile, Breaking load, Burst, Molecular/ Fibre direction, etc.), Chemical (Unreacted chemicals present, pH, etc.), Biological (sensitivity to micro-organisms), Permeability (Barrier properties – Absorption/Diffusion of moisture and gases).

## UNIT-III

**Introduction to Packages :** Introduction to Papers and Board based Packaging– Coarse Paper, Fine Paper, Treated Paper, Laminated Paper, Advantages and limitations of paper board



packaging materials, Folding Cartons, Set up Boxes, Corrugated Boxes, Multiwall paper sacks, Plastic woven Sacks, Paper Bags.

**Plastic Packaging:** Introduction to Plastic Packaging, Types of Plastic films, Packaging Forms of Plastics, Accepting Packaging, flexible Packaging, Freeze Packaging Protection, Tamper-Evident Banding.

#### UNIT-IV

**Metal Packaging:** Types of Metal Package, Mechanical Properties of Metal Container, Method of Manufacturing – Three piece Can, Two piece Can, Necked-in Can, Easy-Open Ends, Collapsible Tubes, aerosol Package, Metal foils, Laminates.

**Glass Packaging:** Glass Packaging Forms, requirements of Glass Container, Coating in Glass Containers, Closures for Glass Containers, **Wooden Packaging:** Physical Characteristics of Wooden containers, Types of Wooden Boxes, Wooden Crates, Physical and mechanical properties of timber, Defects of timber, methods of preservation of timber.

#### Text & Reference Books:

1. **Fundamentals of Packaging Technology** by Soroka, IoPP, 2002.
2. **The Packaging User's Handbook Paine** by F. A., 1st Ed, Blackie Academic & Professional, 1991.
3. **Packaging Technology** Byett J. et al., 2<sup>nd</sup> Ed, The Institute of Packaging (SA), 2001.
4. **Plastics Packaging: Properties, processing, Applications and Regulation** - Selke, S. E. M., Culter, J. D. and Hernandez, R. J, Carl Hanser Verlag, USA, 2004.
5. **Handbook of Package Engineering** Joseph F. H, Robert J. K, Hallie F, Third Edition, Technomic Publishing, 1998.
6. **The Wiley Encyclopedia of Packaging Technology** by Yam K. L, Third Edition, Wiley, 2009.

HISAR

# COMPUTER AIDED DESIGN AND MANUFACTURING

(Students from Department of Mechanical Engineering cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-ME-491-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.  For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT-I

**Introduction and Geometric modeling:** Historical developments, product life cycle, CAD/CAM systems, scope of CAD/CAM, CAD/CAM applications, 3D modeling approaches, types of geometric modeling, coordinate systems, sketching and sketch planes, basic features of a CAD/CAM system (extrusion, revolution, hole, cut, sweep, loft, fillet, chamfer, rib, shell, draft, patterns spiral and helix), feature based modeling, parametric modeling, datum features, geometric constraints, modeling operations, heterogeneous modeling, modeling strategies, master model, system modes, model viewing.

## UNIT-II

**Transformations:** Introduction, transformation of points and line, 2-D translation, rotation, reflection, scaling, homogeneous representation, concatenated transformation, mapping of geometric models, 3-D scaling, shearing, rotation, reflection and translation, combined transformations.

## UNIT-III

**Curves, surfaces and solids:** Cubic-Spline curve, Bezier curve and B-Spline curve, plane surface, ruled surface, surface of revolution, tabulated cylinder, bi-cubic surface, Bezier surface, B-Spline surface, geometry and topology, Solid models and representation schemes, boundary representation, constructive solid geometry, sweep representation

## UNIT-IV

**CNC Technology:** Introduction, types of NC systems, NC machine tools, principle of operation of CNC, advantages and limitations of CNC systems, Direct numerical control (DNC) and its application, NC part programming, coordinate systems, NC programming languages, G & M codes, Part program for simple parts.

### Text & Reference Books:

1. Zeid, I., "CAD/CAM", McGraw Hill, 2008.
2. Groover and Zimmer, "CAD/ CAM", Prantice Hall.
3. Rogers, D. F. and Adams, J. A., "Mathematical Elements for Computer Graphics", McGraw Hill.
4. Radhakrishnan, P. and Kothandaraman, C. P., "Computer Graphics & Design", Dhanpat Rai Publication", 2nd edition, 2005.
5. Krishnamoorathy, C. S. and Rajeev, J. S., "Computer Aided Design (Software and Analysis Tools)", Narosa Publication House, 2nd edition, 2005.
6. Kundra T. K., Rao P. N. and Tiwari N. K., "Numerical Control and Computer Aided Manufacturing", McGraw Hill.

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GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY  
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# STATISTICAL COMPUTING

(Students from Department of CSE cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-CSE -491-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT-I

**Review of Descriptive Statistics and Probability Theory:** Scale of measurement and data types, Descriptive statistics, Frequency Tables and graphs, Relative frequency tables and graphs, grouping data, histograms and ogive, mean, median, mode, variance and standard deviation of sample data, Sample spaces and events, Axioms, Conditional Probability, Independent event, Bayes Theorem, Binomial Theorem.

## UNIT-II

**Random Variable and Distributions:** Random variables, type of random variables, Mean (Expectation) and variance of a discrete random variables, Discrete uniform distribution, Bernoulli's distribution, Binomial distribution, Geometric distribution, Poisson's distribution, Mean and variance of a continuous random variable, Continuous uniform distribution: normal distribution.

## UNIT-III

**Hypothesis testing:** determining levels of significance, Types of hypothesis testing errors, Hypothesis testing for population mean for large and small samples; Comparing two population means for large and small independent samples; Comparing two population means for paired samples; Chi-Square, t test and F test, Analysis of variance (ANOVA).

## UNIT-IV

**Statistical Learning and Linear Regression:** Definition of statistical learning, Estimating a function  $f$ , The trade of between prediction accuracy and model comprehensibility, Regression versus Classification problems, Measuring the quality of fit, Linear Regression between variables, Estimating the Coefficients, accessing the accuracy of the coefficient estimates, assessing the accuracy of the model.

Text & Reference Books:



1. Ross Sheldon M., Introduction to Probability and Statistics for Engineers and Scientists, 4th edition, Academic Press, 2009.
2. Douglas S. Shafer and Zhang Zhiyi, Beginning Statistics, 2012. [Available freely online under Creative Commons by-nc-sa 3.0 license.]
3. Brain S. Everitt, A Handbook of Statistical Analysis Using R, Second Edition, LLC 2014
4. Roger D. Peng, R Programming for Data Science, Lean Publishing, 2015.
5. Michael J. Crawley, Statistics, An introduction using R, Second edition, John Wiley, 2015
6. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning: Data Mining, Inference and Prediction, Springer, 2<sup>nd</sup> edition, 2009.

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HISAR

# INTRODUCTION TO MATLAB AND SIMULINK

(Students from Department of ECE cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-ECE-491-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT-I

**Introduction to MATLAB:** Introduction to MATLAB Software: MATLAB Window, Command window, Workspace, Command history, setting directory, basic commands, Assigning variables, operations with variables, Data files and data types: Character and String, Arrays and vectors, Column vectors, Row vectors.

## UNIT-II

**MATLAB Operations and Plots:** Arithmetic operations, Operators and special characters, Mathematical and Logical operators, solving arithmetic equations, Matrix operations: Transpose, determinant and inverse, Trigonometric functions, Complex Numbers, Fractions, Real numbers, M files, Plots: 2D plots, 3D plots, GUI Design.

## UNIT-III

**MATLAB Simulink :** Introduction of Simulink, Simulink environment and Interface, Study of Library, Circuit oriented design, Equation oriented design, Model, Subsystem Design, Connect call back to subsystem, Application.

## UNIT-IV

**MATLAB Programming:** Control statement programming, Conditional statement programming, Loop and Conditional statements: if, else, switch, for, while, continue, break. User defined functions, Built in Function, Function calling, Return value, Type of functions, Global variables.

### Text Books:

1. Getting started with MATLAB by Dr. Rudra Pratap, OXFORD University Press.
2. Modeling and Simulation using MATLAB-Simulink by Dr. Shailendra Jain, Dr. Sanjeevan Kapshe, Wiley.
3. MATLAB and Simulink by Dr. Partha S Mallick, Scitech Publications Pvt. Ltd.

**Reference Books:**

1. Introduction to MATLAB for engineers by William J. Palm.
2. Essential of MATLAB Programming by Stephen J. Chapman.

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# INSTRUMENTAL ANALYSIS OF FOODS

(Students from Department of Food Technology cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-FT-491-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT-I

Methods of analysis, introduction and scope of various analytical methods for food samples such as food colour, pH value and turbidity; Importance, methods and types of sampling; Uses and roles of various grinding instruments/ machines for preparation of samples for analysis; Expression of results; Methods of moisture analysis in food – drying methods; Near infrared (NIR) techniques, isothermic technique; Analysis of principal food constituents such as carbohydrates, proteins, fat, vitamins and minerals by various methods.

## UNIT-II

Methods for separation, identification and quantification of various food components; Separation methods – filtration, centrifugation, sedimentation; Electrophoresis: gel electrophoresis, paper electrophoresis, high voltage electrophoresis, starch gel electrophoresis; Basic principles of spectroscopy: UV, visible and fluorescence spectroscopy.

## UNIT-III

Refractometric techniques (refractive index) and instruments for various food components including flavour component and food additives; Methods for measuring textural properties of foods– Instron food tester, penetrometer, texture analyser; Methods for measuring rheological properties of foods – viscoamylograph, extensograph, alveograph, farinograph and mixograph etc.

## UNIT-IV

High performance liquid chromatography (HPLC)– types of column and their applications, high pressure pumps, various types of detectors for HPLC; Gas chromatograph (GC) and gas liquid chromatography (GLC); mass spectrophotometer and their applications in food.

### Recommended Readings:

1. Nielson S. S. (2003) *Food analysis*, Kluwer Academic Press.



2. Pomeranz Y. J. (2000) *Food Analysis*, Springer Publications.
3. Srivastava (2000) *Instrumental Approach to chemical analysis*, S. Chand Publishers.
4. Winton A. L. (1999) *Techniques of food analysis, Allied Science, Official methods of analysis*, Association of official analytical chemist USA.
5. Das H. (2005) *Food processing operations analysis*, Asian Books private ltd.
6. James CS (1998). *Analytical chemistry of foods*, BlackicAcad, UK.
7. Winton, AL (1999). *Techniques of food analysis*, Allied Science Publication, New Delhi.

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# ENVIRONMENTAL ENGINEERING

(Students from Department of Civil Engineering cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-CE-491-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT – I

**Water:** Water Supply systems: Need for planned water supply schemes, Sources of Water, Water demand and Potable, industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design.

## UNIT – II

**Sewage:** Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage: Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems Storm Water: Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, recycling of sewage –quality requirements for various purposes.

## UNIT – III

**Air:** Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution – Occupational hazards, urban air pollution: automobile pollution, Chemistry of combustion, Automobile engines, quality of fuel, operating conditions and interrelationship. Air quality standards, Control measures for Air pollution, construction and limitations

## UNIT – IV

**Noise:** Basic concept, measurement, effects and various control methods

### Recommended Readings

1. Introduction to Environmental Engineering by P. Arne Vesilind, Susan M. Morgan, Thompson / Brooks/Cole; Second Edition 2008
2. Introduction to Environmental Engineering, Vesilind, PWS Publishing Company 2000
3. Environmental Engineering, Vol. I ,S.K Garg ,Khanna Publishers, New-Delhi.(1990)
4. Water Supply and Sewerage, E.W. Steel
5. CPHEEO Manual on Water Supply & Treatment

6. Manual on Water Supply and Treatment, (latest Ed.), Ministry of Works & Housing, New Delhi.
7. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
8. Environmental Engineering by H.S. Peavy, D.R. Rowe, G. Tchobanoglous; 1991, Tata-McGraw Hill

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CYBERU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY  
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# ENERGY MANAGEMENT AND AUDIT

(Students from Department of Electrical Engineering cannot opt this subject as Open Elective)

General Course Information	
Course Code: OE-EE-491-T	<b>Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)</b> Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks), and end semester examination of 70 marks.
Course Credit: 3	
Contact Hours: 3/week, (L-T-P:3-0-0)	For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.
Mode: Lectures	
Examination Duration: 3 Hours	

## UNIT-I

**Energy Scenario:** Commercial and Non-Commercial Energy, Primary and Secondary Energy Resources, Conventional and non-conventional energy, Commercial Energy Production, Final Energy Consumption, Energy Needs of Growing Economy, Long Term Energy Scenario.

## UNIT-II

**Energy Management Functions:** Need for energy management, Energy management program, Organizational Structure, Energy Policy, Planning, Audit Planning, Educational Planning, Strategic Planning, Reporting

## UNIT-III

**Electrical Energy Management:** Electricity tariff, Electrical Load Management and Maximum Demand Control, Maximum demand controllers, Power Factor & Its importance, Automatic power factor controllers.

## UNIT-IV

**Energy Audit:** Definition, Energy audit-need, Types of energy audit, Energy Auditing Services, Basic Components of an Energy Audit, Specialized Audit Tools, Industrial Audits, Commercial Audits.

### Text & Reference Books:

1. Wayne C. Turner, Steve Doty, "Energy Management Hand book", The Fairmont Press, 6th Edition, 2007
2. Amit K. Tyagi, "Handbook on Energy Audits and Management", Tata Energy Research Institute, 2nd reprint, 2003.
3. Barney L. Capehart, Wayne C. Turner, William J. Kennedy, "Guide to Energy Management", CRC Press.
4. www.bee-india.nic.in, BEE Reference book: no.1/2/3/4.

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