गुरु घासीदास विश्वविद्यालय
(केन्द्रीय विश्वविद्यालय अधिनियम 2009 क्र. 25 के अंतर्गत स्थापित केन्द्रीय विश्वविद्यालय)
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## Implementation of CBCS / ECS

## Minutes of Meetings (MoM) of Board of Studies (BoS)

| Academic Year : 2021-22 | |
|---|---|
| **School** | : *School of Studies of Engineering and Technology* |
| **Department** | : *Mechanical Engineering* |
| **Date and Time** | : *Oct,1,2021- 02:15PM* |
| **Venue** | : *Online Platform* |

### Minutes of Meeting

An online meeting of the Board of Studies of Mechanical Engineering was held on 01-10-2021 at 02:15 PM. The meeting was attended by the following members:

| | | | |
|---|---|---|---|
| 1. | Chairman, BOS | Prof. T. V. Arjunan<br>Head, Dept. of Mechanical Engg. | Present |
| 2. | Member, Academic Expert | Prof. S. Murugan<br>Dept. of Mechanical Engg., NIT Rourkela | Present |
| 3. | Member, BOS | Dr. Pankaj Kumar Gupta<br>Assoc. Prof., Dept. of Mech. Engg. | Present |
| 4. | Member, BOS | Mrs. Shweta Singh<br>Asst. Prof., Dept. of Mech. Engg. | Present |
| 5. | Member, Industry Expert | Mr. Vivek Singh,<br>Executive Engineer, Damodar Valley Corporation<br>Kodarma Thermal Power Station, Jharkhand | Present |

The course syllabi for 3rd and 4th semesters of B. Tech. II Year as well was discussed. Furthermore, courses for Ph.D. work in the electives category were revised.

With the consent of all the members, the course scheme and syllabi for 3rd and 4th semesters in II year B.Tech. Mechanical Engineering was finalized, and new courses were added in the list of electives for Ph.D. course work. The following were the salient features discussed in the meeting:

1. In the course on Engineering Thermodynamics in 3rd semester, the sequence of Modules was slightly altered without adding/deleting any content.
2. The total number of classes for teaching the B.Tech. courses was changed according to 14 weeks of working in both semesters.
3. The name of Manufacturing Science course was changed to Manufacturing Technology.
4. In the scheme of courses, all courses were re-typed in Sentence case changing from all Caps.
5. The Professional Electives offered in IV semester was dropped to equip students with fundamental core subjects. It was suggested to offer Professional Electives from the III year onwards.
6. The following list of courses were suggested to be included in the Electives category for Ph.D. course-work:
   (a) Systems Engineering
   (b) Advanced IC Engines Technology
   (c) Fuel Cell and Electric Vehicle Technology
   (d) Energy in Buildings
   (e) Noise, Vibration & Harshness
   (f) Waste Minimization Techniques and Applications
   (g) Robotics
   (h) Energy Modeling and Simulation

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(i)   Vibration and Control

(j)   Energy Modeling & Policy Analysis

(k)  Energy Resource & Modeling

(l)   Renewable Energy

(m) Industrial Automation & Controls

7.  It was suggested to combine the Courses – Solar Energy Engineering & Applications and Design of Solar Thermal Systems into one course.

These changes shall be effective from Academic session 2021-2022.

The detailed Scheme of Credits and Syllabi in the 3$^{rd}$ and 4$^{th}$ semesters of II year B.Tech. (Mechanical Engineering) courses and in Ph.D. course work is attached herewith for reference.


Prof. T. V. Arjunan
Chairman, BOS

Dr. Pankaj K. Gupta
Member, BOS

Mrs. Shweta Singh
Member, BOS


Dr. S. Murugan
Professor
Department of Mechanical Engineering
NIT, Rourkela

Prof. S. Murugan
Academic Expert

Email Consent Given

Mr. Vivek Singh
Industry Expert


विभागाध्यक्ष/Head
यांत्रिकी अभियांत्रिकी विभाग/Mechanical Engg. Dept.
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- Re: Approval of the BOS minutes        https://mail.google.com/mail/u/0/?ik=8bfbe818o6&view=pt&search=a

**Gmail**                                      Pankaj Kumar Gupta <pankajkgupta@gmail.com>

## Re: Approval of the BOS minutes

vivek singh <vivek.singh.dvc@gmail.com>                    Fri, Nov 19, 2021 at 3:08 PM
To: Pankaj Kumar Gupta <pankajkgupta@gmail.com>
Cc: s murugan <murugans@nitrkl.ac.in>, muruganresearch@yahoo.com, "T.V.Arjunan" <arjun_nivi@yahoo.com>

Dear sir,
        The attcahed sylabus of M Tech. machine design and B Tech. 2nd year had been checked and found OK.
Approval from my end is accorded.

With Regards
Vivek Singh
Sr. Divisional Engg. (M)
DVC KTPS

[Quoted text hidden]

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## Scheme and Syllabus- PhD

Department of Mechanical Engineering, School of Engineering & Technology, GGV, Bilaspur (C.G.)

## DEPARTMENT OF MECHANICAL ENGINEERING
## INSTITUTE OF TECHNOLOGY
## GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.), 495009
### EVALUATION SCHEME OF Pre-Ph. D COURSE WORK
#### EFFECTIVE FROM SESSION 2021-22

| SN. | Name of the Subject | Subject Code | Periods / Week L – T – P | ESE Duration | ESE MARKS Max. | ESE MARKS Min. | Credits |
|-----|---------------------|--------------|--------------------------|--------------|------|------|---------|
| 1 | Research Methodology in Engineering | ETPHDT00 | 3 – 1 – 0 | 3 Hrs. | 100 | 40 | 4 |
| 2 | Elective - I | ** | 3 – 1 – 0 | 3 Hrs. | 100 | 40 | 4 |
| 3 | Elective - II | ** | 3 – 1 – 0 | 3 Hrs | 100 | 40 | 4 |
| 4 | Seminar | ETPHDS00 | - | - | Qualified/Not qualified | | --- |
| | **Total** | | 9 – 3 – 0 | - | 300 | 165* | 12 |

Duration of the semester will be 6 months.
*Candidate has to score minimum 55% of the aggregate marks to qualify in ESE.
Two core subjects as Electives (4 credits each) to be decided by the DRC.

| LIST OF ELECTIVES SN | Name of the Subject | ** Subject Code | LIST OF ELECTIVES SN | Name of the subject | ** Subject Code |
|-----|---------------------|-----------------|-----|---------------------|-----------------|
| 1 | Mechatronic System Design | MEPHDT01 | 9 | Finite Element Methods in Engineering | MEPHDT09 |
| 2 | Reliability and Maintenance Engineering | MEPHDT02 | 10 | Fracture, Fatigue and Failure Analysis | MEPHDT10 |
| 3 | Composite Materials | MEPHDT03 | 11 | Physics of Manufacturing Processes | MEPHDT11 |
| 4 | Material Characterization Techniques | MEPHDT04 | 12 | Energy Conservation and Waste Heat Recovery | MEPHDT12 |
| 5 | Advanced Machining Processes | MEPHDT05 | 13 | Supply Chain and Logistic Performance Management | MEPHDT13 |
| 6 | Micro and Precision Manufacturing | MEPHDT06 | 14 | Production and Operations Management | MEPHDT14 |
| 7 | Industrial Automation | MEPHDT07 | 15 | Design Of Solar Thermal Systems and Applications | MEPHDT15 |
| 8 | Engineering Design Methodology | MEPHDT08 | 17 | Modeling and Analysis of Solar Systems | MEPHDT16 |

L : Lecture, T: Theory, P: Practical, Max.: Maximum Marks in ESE; Min.: Minimum Pass Marks in each subject as 40

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## MEPHDT11- PHYSICS OF MANUFACTURING PROCESSES

Introduction of manufacturing processes from the point of view of underlying physics. Stresses and Strain: stress and strain behaviour of materials, plastic and tangent modulus, work hardening, plastic instability in tensile test, empirical stress-strain equations, effect of pressure, strain-rate and temperature, analysis of stress tensor, eigen values, decomposition into deviatoric and hydrostatic components, octahedral stresses, analysis of strain and strain-rates, stress equilibrium and virtual work, objective stress rates. Plasticity: the criteria of yielding, isotropic and anisotropic hardening, rules of plastic flow, Levy-Mises and Prandtle-Reuss equations, anisotropic flow rule, Hill's 1948 and 1979 yield criteria for anisotropic yielding. Upper bound theorem and its application in processes like rolling, wire drawing, extrusion, forging and machining. Lower bound theorem with a few applications. Slab method and its application in process like asymmetric rolling, forging, wire drawing and extrusion. Elasto plastic sheet bending. Analysis of auto frettaging. Theory of slipline field and its application in metal forming and machining. Heat transfer analysis in manufacturing. Workability and dynamic materials model.

### Text books:

[1] Chakrabarty, J., Theory of plasticity, McGraw Hill Book Company, Singapore, 1998.

[2] Johnson, W. and Mellor P.B., Engineering plasticity, Von NostrandReinhold Company, London, 1972.

[3] Bhattacharyya, A., Metal cutting: theory and practice, New Central Book, Kolkata, 1984.

[4] Incropera, F.P. and DeWiit, D.P., Fundamentals of heat and mass transfer, John Wiley & Sons, Singapore.

[5] Prasad, Y.V.R.K., Sasidhara, S., Hot working guide: a compendium of processing maps, ASM International, Materials Park, OH, 1997

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## MEPHDT13- SUPPLY CHAIN AND LOGISTIC PERFORMANCE MANAGEMENT

### UNIT I:

**Supply Chain Management and sustainability:**

Core of supply chain and management and its components, how supply chain works, Importance of supply chain, Supply chain networks, big data in the supply chain, supply chain analytics and its differentiator. SC sustainability concept, pillars and challenges in current modern organizations.

### UNIT II:

**Supply chain management strategies:**

Introduction of SC strategies, the concept, nature, scope, importance of lean SC strategy-theoretical Models, eights kinds of waste. Sustainable supply chain strategies, Green SC management objective, model and current policy. Agile and Le-Agile strategies to sustainable SC, Resilient strategy contribution to sustainable SC.

### UNIT III:

**Performance Measurement and its models:**

SC performance measurement, measures, metrics, SC strategic goals, Supply chain performance and SCOR model, Maturity models, Reference models, and Benchmarking model, Application of model towards supply chain. Types of information, Estimation of various types of costs. Application and appraisal of metrics and KPIs.

### UNIT IV:

**Planning Demand and Supply in SC:**
Demand Forecasting in a Supply Chain: The Role of Forecasting in a Supply Chain ,Characteristics of Forecasts, Components of a Forecast and Forecasting Methods ,Basic Approach to Demand Forecast1ng, Time-Series Forecasting Methods ,Measures of Forecast Error, Risk Management in Forecasting , Forecasting in Practice.

### UNIT V:

**Logistic SC**

Logistic Management-Forward and reverse supply chain measures and metrics, Role of transportation in supply chain, modes of transport, transportation in practice, Logistic Equipments, Sourcing Decisions in Supply Chain- role of sourcing, third and fourth party logistics providers, supplier scoring & assessment, Supplier selection -auctions, and negotiations, contracts, procurement process.

**Reference books:**

1.Supply Chain Management: Janat Shah, Pearson Publications.
2. Supply Chain Management: Sunil Chopra and Mein del, Fourth Edition, PHI.

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## MEPHDT14- PRODUCTION AND OPERATIONS MANAGEMENT

### UNIT I: INTRODUCTION TO OPERATIONS MANAGEMENT

History and concept of production and operations management, strategic importance of Operations Management; decisions in operations: products and service, process and technology, Capacity and facilities, human resources, quality, and sourcing. Tools of decision-making decision in operations using excel

### UNIT II: PRODUCTION PROCESS DESIGN & MANAGEMENT

Types of processes: Projects, batch production, Mass Production, continuous production; Process Planning: Make or buy Design, Process selection with break-even analysis, Process plans; Process analysis, Process Innovation, Technology Decisions, Job sequencing algorithms-Johnsons rule.

### UNIT III: PRODUCT DESIGN

Product Design Process: Idea generation, feasibility study, Form Design, functional Design, final design and process plans; Technology in Design, Design Quality Review, Design for Environment, Metrics for design quality, Design for Manufacture & Assembly (DFMA), Quality Function Deployment.

### UNIT IV: PRODUCTION FACILITIES DESIGN

Facility location, Basic Layouts-process, product, fixed position layouts; Designing process layout: block diagramming, relationship diagramming, computerized solutions; Designing a service Layouts, Shared spaces, Designing Product Layouts: Line balancing, computerized line balancing; Hybrid Layouts- Cellular, flexible manufacturing systems, Mixed model assembly lines

### UNIT V: QUALITY MANAGEMENT

Evolution of Quality Management System, Quality Management: Statistical Process control, TQM, Cost of Quality, Effect of Quality Management on Productivity, Quality improvement: JIT, Kaizen approach; Work measurements-work study, time study; Forecasting, Inventory management, Human Resource management in operations.

**Text books**
1. Operations Management by Roberta S. Russell and Bernard W. Taylor (III); Pearson Education, 2003 edition.
2. R. Panneerselvam, Production & Operations Management, PHI
3. S.N. Chary, Production & Operations Management, TMH
4. Shailendra Kale, Production and Operations Management, McGraw Higher Ed.
5. Operations Management, Arun Kumar and N. Meenakshi, Cengage Learning
6. K.C. Jain, Production and Operations Management, Wiley India.

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## Department of Mechanical Engineering, School of Engineering & Technology, GGV, Bilaspur (C.G.)

### MEPHDT15- DESIGN OF SOLAR THERMAL SYSTEMS AND APPLICATIONS

**Solar Radiation Fundamental:** Basics of Solar Radiation, instruments for measuring solar radiation, solar radiation geometry, empirical equations, solar radiation on tilted surfaces.

**Low and Medium temperature solar thermal technology:** Flat plate, Evacuated tube collectors and PVT collectors- Basic elements, performance analysis, transmissivity - absorptivity, heat transfer coefficients and correlations, collector efficiency and heat removal factors, effects of various parameters, transient analysis. Energy balance of components, design process and parameters.

**High-temperature solar thermal technology:** Concentrating Solar Thermal (CST) Technologies, types - Parabolic Trough Collector, Linear Fresnel, Solar Tower, Parabolic Dish, Solar Furnace; general characteristics, geometry, heat transfer correlations, tracking requirements, performance analysis and design process, use of various HTF.

**Application of Solar thermal energy:** Solar Air heaters, Solar Drying, solar pond, solar refrigeration, Solar cooking, solar still, Solar Distillation-Desalination, Solar thermal power plants, Industrial process heat, etc.

**Case studies on Recent Developments in the Solar thermal Collectors:** Highlights of the latest heat transfer enhancement techniques such as use of novel selective coatings with nano particles, HTF with nano particles, use of fins and different surface geometry, Artificial surface roughness, Integration of novel Energy storage medium, thermal energy storage – sensible and latent heat etc.

**REFERENCE BOOKS:**
1. Foster .R, Ghassemi M., Cota A., "Solar Energy", CRC Press, 2010.
2. Duffie .J.A, Beckman W.A. "Solar Engineering of Thermal Processes", 3rd ed., Wiley, 2006.
3. De Vos .A, "Thermodynamics of Solar Energy Conversion", Wiley-VCH, 2008.
4. Garg .H.P, Prakash J, "Solar Energy Fundamentals and Applications", Tata McGraw-Hill, 2005.
5. Kalogirou .S, "Solar Energy Engineering", Processes and Systems, Elsevier, 2009.
6. Tiwari G. N. (2002); Solar Energy: Fundamentals, Design, Modeling and Applications, Narosa.
7. María Isabel Roldán Serrano, "Concentrating Solar Thermal Technologies: Analysis and Optimisation by CFD Modelling", Springer International, 2017.
8. Brian Norton, "Solar Energy Thermal Technology" Springer, 1992
9. G. Lorenzini, C. Biserni & G. Flacco "Solar Thermal and Biomass Energy" WIT Press 2010.
10. Zhifeng Wang, "Design of Solar Thermal Power Plants", Elsevier, 2019.
11. Manuel J. Blanco and Lourdes Ramirez Santigosa "Advances in Concentrating Solar Thermal Research and Technology" Woodhead Publishing, 2017

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## Department of Mechanical Engineering, School of Engineering & Technology, GGV, Bilaspur (C.G.)

### MEPHDT16- MODELING AND ANALYSIS OF SOLAR SYSTEMS

### UNIT I - MATHEMATICAL MODELING
Principles of mathematical modelling; systems, models, simulations; definitions of mathematical models; classification of mathematical models.

### UNIT II – PHENOMENOLOGICAL MODELS
Elementary statistics; Regression techniques – linear, multiple-linear, non-linear; Neural networks; Design of experiments.

### UNIT III – MECHANISTIC MODELS
Ordinary differential equations and Partial differential equations; setting up of differential equations; Closed form solutions; Numerical solutions

### UNIT IV –ENERGY MODELLING
Introduction; Energy and climate change; Atmospheric environment and renewable energy; Solar energy models – Solar energy deterministic models

### UNIT V – SOLAR ENERGY MODELS
Linear solar energy models; Non linear solar energy models; Solar radiation devices and collectors; Case studies of solar energy modelling and analysis

### REFERENCES BOOKS
1. Velten, K, "Mathematical Modelling and Simulation – Introduction for Scientists and Engineers", Wiley-VCH., 2009.
2. Sen .Z, "Solar Energy: Fundamentals and Modeling Techniques", Turkey, 2008.
3. Dym .C.L, "Principles of Mathematical Modeling", Elsevier, 2004.
4. Duffie .J.A, Beckman W.A. "Solar Engineering of Thermal Process", Wiley, 3rd ed. 2006.
5. Kalogirou .S.A, "Solar Energy Engineering: Processes and Systems", Academic Press, 2009.

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