Scheme & Syllabi

for

Pre-Ph.D.
(Mechanical Engineering)

(w.e.f. Winter Session 2024-2025)

(Total Credits =12)

Department of Mechanical Engineering

Guru Jambheshwar University of Science & Technology,
Hisar-125001

Pre-Ph.D. (*Scheme*)

Sr. No.	Course Code No.	Nomenclature	Credits	Internal	External	Max. Marks	Exam. Duration
1.	PPD-101	Research Methodology	4	30	70	100	3 Hrs.
2.	PPD-102	Review of Literature and Seminar	2	50	--	50	--
3.	PPD- 103	Departmental Elective Course	4	30	70	100	3 Hrs.
4.	PPD-104	Research and Publication Ethics (RPE)	2	15	35	50	2 Hrs.

LIST OF DEPARTMENTAL ELECTIVE COURSES

Code	Subject	L	T	P	Cr.
PPD-103 (i)	Heat Transfer and Design of Thermal Systems	4	-	-	4
PPD-103 (ii)	Computer Aided Design and Manufacturing	4	-	-	4
PPD-103 (iii)	Advanced Production Technology	4	-	-	4
PPD-103 (iv)	Lubrication and Biomaterials	4	-	-	4

Pre-Ph.D. (*Syllabi*)

PPD-101: RESEARCH METHODOLOGY

Course Code: PPD-101 Course Credits: 4.0 Contact Hours: 4 hours/week (4 Lectures) Examination Duration: 3 hours	**Course Assessment Methods:** **Internal Examination (30 marks):** *Two minor tests each of 20 marks will be conducted. The highest marks obtained by a student in any of the two minor examinations will be considered. Class performance will be measured through percentage of lectures attended (04 marks), Assignments, quiz, etc., (06 marks).* **End semester examination (70 marks):** *The examiner is required to set 9 questions in all. The first question will be compulsory covering the entire syllabus and consisting of 4 short answers type questions of 3.5 marks each. In addition to that, 8 questions have to be set consisting of 2 questions from each unit. A candidate is required to attempt 5 questions in all, selecting one question from each unit and the compulsory question No. 1. All questions carry equal marks.*

UNIT-I

Introduction: Nature, objectives and motivation of research, types of research, research approaches, significance of research, research and scientific method, importance of research methodology, criteria of good research, problems encountered by researches in India, benefits to the society in general, and research process.

Research problem and its formulation: Defining the research problem: definition, types and its characteristics, necessity of defining the problem, research problem identification, literature review, scope and formulation of hypothesis, and problem formulation.

UNIT-II

Statistical analysis Measure of central tendency, dispersion, mean, median, mode, range, mean deviation, standard deviation, problems, and data preparation and analysis.

Probability distribution: Discrete, continuous and mixed random variables, definition of probability, addition rules and condition probability, binomial, Poisson, sampling and geometric distributions, sample tests: Chi square test.

UNIT-III

Research Design: Meaning of research design, need, and features of research design, parts and classifications, research design process, different research designs, basic principles of experimental design and developing a research plan.

Modeling: Basics of models, design of experimental set-up, use of standards and codes, type of models, model building and stages, need and types of simulation.

UNIT-IV

Research Report Writing: Format of the research report, synopsis, dissertation, thesis its differentiation, references/bibliography, technical paper writing/journal report writing, Research proposal preparation: writing a research proposal and research report, writing research grant proposals.

Computer Application for presentation: Making presentation, use of visual aids, basic presentation skills for documentation and presentation tools: PowerPoint, Microsoft office, and knowledge of online tools.

Recommended Books:

1. Agarwal, Y.P., (2004). Statistical Methods: Concepts, Application and Computation, Sterling Publs. Pvt. Ltd., New Delhi.
2. Ganesan, R., (2011). Research Methodology for engineers, MJP Publishers.
3. Khananabis, R. & Saha, S., (2015). Research Methodology, University Press, Hyderabad.
4. Kothari, C.R., (2004). Research Methodology, Methods and Techniques, New Age International Publishers.

5. Krishnaswamy, K.N., Sivakumar, A.I. & Mathirajan, M., (2018). Research Methodology; Integration of Principles, Methods and Techniques. Pearson Education, New Delhi.
6. Kumar, R., (2005). A step-by-step guide for beginners, Pearson Education.
7. Meyer, P.L., (1970). Introductory Probability and Statistical Applications, Addison Wesley.
8. Singh, Y.K., (2006). Fundamentals of Research Methodology, New Age International Publishers.
9. Upagade V. & Shende, A., (2009). Research Methodology, S. Chand & Company ltd., New Delhi.

PPD-102: REVIEW OF LITERATURE & SEMINAR

Course Code: PPD-102 Course Credits: 2.0 Contact Hours: 2 hours/week	**Course Assessment Methods:** **Internal Examination (50 marks):** *It includes discussions on research ethics, presenting a seminar on review of published research or on own published reviews/survey paper or training or field work done in relevant area of research before a three members committee duly constituted by the Dean, Research and Development and headed by the Chairperson/Director or Senior teacher of the Department/School.*

Detailed Contents

Literature survey: Overview – What is literature survey, Functions of literature survey, maintaining a notebook, developing a Bibliography, Searching for publications – Publication databases, search engines and patent databases, Find some/all of the references for a given paper, including those that are not on the web.

How to study a scientific paper: Summarizing papers already published: – Reading abstracts and finding ideas, conclusion, Advantages of their approach, the drawbacks of the papers (What is lacking – can be found in the sections such as future work) Generalize results from a research paper to related research problems, Comparing the approach - Identify weaknesses and strengths in recent research articles in the subject.

Publishing a paper: How to write a scientific paper, Structure of a conference and journal paper, abstract writing, chapter writing, discussion, conclusion, references, bibliography and In-class discussion of technical writing examples, Poster papers, review paper, Research ethics – Legal issues, copyright, plagiarism, General advice about writing technical papers in English - Tips for writing correct English.

NOTE: *At the end of semester, the scholars have to submit the report as well as present a seminar on a review of 20 to 30 research papers in relevant field.*

PPD 103(i): HEAT TRANSFER AND DESIGN OF THERMAL SYSTEMS

Course Code: PPD-103(i) Course Credits: 4.0 Contact Hours: 4 hours/week (4 Lectures) Examination Duration: 3 hours	**Course Assessment Methods:** **Internal Examination (30 marks):** *Two minor tests each of 20 marks will be conducted. The highest marks obtained by a student in any of the two minor examinations will be considered. Class performance will be measured through percentage of lectures attended (04 marks), Assignments, quiz, etc., (06 marks).* **End semester examination (70 marks):** *The examiner is required to set 9 questions in all. The first question will be compulsory covering the entire syllabus and consisting of 4 short answers type questions of 3.5 marks each. In addition to that, 8 questions have to be set consisting of 2 questions from each unit. A candidate is required to attempt 5 questions in all, selecting one question from each unit and the compulsory question No. 1. All questions carry equal marks.*

UNIT-I

Basic Concepts and Thermo-physical Properties of Fluids: heat transfer fundamentals, coordinate systems, continuity equation, momentum and momentum theorem, conservation of energy, dimensional analysis, units, thermal conductivity, specific heat, thermal diffusivity, thermal expansion.

Conduction Heat Transfer: introduction, basic equations, special functions, steady one- dimensional conduction, extended surfaces, two-dimensional steady conduction, transient conduction.

UNIT-II

Natural and Forced Convection: basic mechanism and governing equations, laminar natural convection flow over flat surfaces, external laminar natural convection flow in other circumstances, internal natural

convection, turbulent flow, empirical correlations, forced convection: internal flows, forced convection: external flows.

Boiling and Condensation: boiling curve**,** boiling nucleation, bubble dynamics, pool boiling heat transfer, introduction to flow boiling, two phase flow patterns, flow boiling in horizontal and vertical tubes, boiling on tube bundles, enhanced boiling, film condensation on low fins, film condensation on single horizontal finned tubes, condensation in smooth tubes, enhanced in tube condensation, film condensation on tube bundles, condensation in plate heat exchangers.

UNIT-III

Heat Exchangers and Heat Transfer Enhancement: Governing relationships, heat exchanger analysis methods, shell and tube heat exchanger, compact heat exchanger, plate and frame heat exchanger, regenerators, fouling, treated surfaces, rough surfaces, extended surfaces, displaced enhancement devices, swirl flow devices, coiled tubes, additives for liquids, active techniques, compound enhancement.

Heat Transfer in Electronic Equipment and Experimental methods: thermal resistances, jet impingement cooling, natural convection heat sinks, phase change phenomenon, thermoelectric coolers, Fundamentals, measurement error, calculation error, curve fitting, equipments.

UNIT-IV

Thermal modeling and Energy Analysis for Solar Dryer and Distiller: Identification of problem, basic energy balance equations, exergy analysis, parametric studies, additional energy requirements, design of experimental solar dryer and distiller, experimentation, mathematical modeling.

Economic Analysis and Optimization Techniques for Thermal Systems: Cost analysis, payback time, benefit-cost analysis, Lagrange multipliers, geometric programming, system simulation and optimization.

Books recommended:

1. Çengel, Y. A. (2022). Heat transfer: A practical approach (5th ed.). McGraw-Hill Education.
2. Holman, J. P. (2010). Heat transfer (11th ed.). McGraw-Hill.
3. Incropera, F. P., Bergman, T. L., Lavine, A. S., & DeWitt, D. P. (2022). Fundamentals of heat and mass transfer (8th ed.). Wiley.
4. Stoecker, W. F. (2004). Design of thermal systems (4th ed.). McGraw-Hill Education.
5. Jaluria, Y. (2019). Design and optimization of thermal systems (3rd ed.). CRC Press.

6. Bejan, A., & Kraus, A. D. (2003). Heat transfer handbook. Wiley-Interscience.
7. Tiwari, G. N. (2015). Greenhouse technology for controlled environment (1st ed.). Narosa Publishing House.

PPD 103(ii): COMPUTER AIDED DESIGN AND MANUFACTURING

Course Code: PPD-103(ii) Course Credits: 4.0 Contact Hours: 4 hours/week (4 Lectures) Examination Duration: 3 hours	**Course Assessment Methods:** **Internal Examination (30 marks):** *Two minor tests each of 20 marks will be conducted. The highest marks obtained by a student in any of the two minor examinations will be considered. Class performance will be measured through percentage of lectures attended (04 marks), Assignments, quiz, etc., (06 marks).* **End semester examination (70 marks):** *The examiner is required to set 9 questions in all. The first question will be compulsory covering the entire syllabus and consisting of 4 short answers type questions of 3.5 marks each. In addition to that, 8 questions have to be set consisting of 2 questions from each unit. A candidate is required to attempt 5 questions in all, selecting one question from each unit and the compulsory question No. 1. All questions carry equal marks.*

UNIT-I

Introduction: Computer numerical control, types of CNC machines, CNC operations, type of cutting tools.

Coordinate Geometry for CNC: Cartesian coordinate system, polar coordinates, coordinate planes, axes and quadrants, Euclidean distance formula, mid-point theorem, slope calculation angle formula, problems.

UNIT-II

3D Modeling: Modeling approaches, types and methods; Constraint based modeling; Parametric modeling; Feature based modeling. Transformations and Projections; curves surfaces and solids

CAD Customization: Controlling the CAD environment; Creating and editing CAD entities; Customizing toolbars and menus; read and write access to modify the models; Developing customized tools and applications with programmatic manipulation of features, assemblies and drawings.

UNIT-III

CAD Customization: Controlling the CAD environment; Creating and editing CAD entities; Customizing toolbars and menus; read and write access to modify the models; Developing customized tools and applications with programmatic manipulation of features, assemblies and drawings.

Part Programming: NC part programming, coordinate systems, NC programming languages, G & M codes, Part program for simple parts, CNC part programming, axes of CNC machines, computer aided part programming using APT.

UNIT-IV

Integration of CAD and CAM for Product Development: Automatic CNC program generation from CAD data, Cutter Location data from 3-D CAD Model for CNC system, Tools for product development--Rapid prototyping, Reverse Engineering.

Incremental Sheet Forming (ISF)–A die-less CNC controlled process: History and Development of ISF, working Principle of ISF, Benefits and Limitations, Challenges and Applications of ISF, Classifications of ISF: Single Point ISF, Two Point ISF, Double Sided ISF, Hybrid ISF, Friction Assisted ISF, Laser Assisted ISF, ISF Process Parameters.

Books Recommended:

1. Zeid, I., & Sivasubramanian, R. (2021). CAD/CAM: Theory and practice (4th ed.). Tata McGraw-Hill Education.
2. Rogers, D. F., & Adams, J. A. (2003). Mathematical elements for computer graphics (3rd ed.). McGraw-Hill International.
3. Browne, J. (2023). Computer aided engineering & design (Latest ed.). ATC International.

4. Rooney, J., & Steadman, P. (2020). Principles of CAD (Latest ed.). Longman Higher Education.
5. Groover, H. P., & Zimmers, E. W. (2014). CAD/CAM: Computer-aided design and manufacturing (4th ed.). Prentice Hall.
6. Bedworth, D., Henderson, M., & Wolfe, P. (1998). Computer integrated design and manufacture (2nd ed.). McGraw-Hill.
7. Rao, P. N. (2018). CAD/CAM: Principles and applications (4th ed.). McGraw-Hill Education.
8. Alavala, C. R. (2021). CAD/CAM concepts and applications (4th ed.). PHI Learning Pvt. Ltd.
9. Fitzpatrick, M. (2023). Machining and CNC technology (8th ed.). Pearson.
10. Mattson, M. (2009). CNC programming: Principles and applications (1st ed.). Cengage Learning.

PPD-103(iii): ADVANCED PRODUCTION TECHNOLOGY

Course Code: PPD-103(iii) Course Credits: 4.0 Contact Hours: 4 hours/week (4 Lectures) Examination Duration: 3 hours	**Course Assessment Methods:** **Internal Examination (30 marks):** *Two minor tests each of 20 marks will be conducted. The highest marks obtained by a student in any of the two minor examinations will be considered. Class performance will be measured through percentage of lectures attended (04 marks), Assignments, quiz, etc., (06 marks).* **End semester examination (70 marks):** *The examiner is required to set 9 questions in all. The first question will be compulsory covering the entire syllabus and consisting of 4 short answers type questions of 3.5 marks each. In addition to that, 8 questions have to be set consisting of 2 questions from each unit. A candidate is required to attempt 5 questions in all, selecting one question from each unit and the compulsory question No. 1. All questions carry equal marks.*

UNIT-I

Metal cutting: Mechanics of chip formation, cutting forces, cutting power, tool life, selection of cutting tool materials and cutting fluids, machining and turning centres, machining, economics. Advanced Machining Processes: Electro discharge machining, electro chemical grinding, electron beam machining, abrasive jet machining and other machining methods, nanofabrication, micromachining, rapid prototyping operations, applications.

UNIT-II

Newer casting and welding techniques: Expendable pattern casting, permanent mold casting, directional solidification, die casting and other casting methods, powder metallurgy process,

Advance welding process- laser welding, ultrasonic welding, electron beam welding, submerged arc welding and other welding methods, welding defects, testing-destructive and NDT, weld ability of plain carbon steels, SS, Al and its alloys.

UNIT-III

Forging, extrusion and sheet metal work: Forging, different forging dies, extrusion and its applications, punching, blanking, bending, deep drawing.

Processing of ceramics, plastics and composites: Production, compaction, sintering of powders, design considerations, shaping of ceramics, processing methods for plastics and composites.

UNIT-IV

Simulation of manufacturing systems: Objectives of simulation in manufacturing, simulation software for manufacturing applications, simulation of different types of shops and manufacturing systems for performance measurement.

Books recommended:

1. Rao, T. V. R. (2010). Metal casting: Principles and practice (3rd ed.). New Delhi, India: New Age International Pvt. Ltd.
2. Rao, P. N. (2017). Manufacturing technology (4th ed.). New Delhi, India: McGraw Hill Education.
3. Campbell, J. (2014). Castings (2nd ed.). Oxford, UK: Butterworth-Heinemann.
4. Nadkari, S. V. (2017). Modern arc welding technology (3rd ed.). Mumbai, India: Oxford & India Book House Pvt. Ltd.
5. Boljanovic, V. (2022). Sheet metal forming processes and die design (3rd ed.). Cleveland, OH: Industria Press.
6. Harper, C. A. (2002). Handbook of plastics, elastomers, and composites (4th ed.). New York, NY: McGraw-Hill.
7. Law, M. G., & Kelton, W. D. (2014). Simulation modeling and analysis (5th ed.). New York, NY: McGraw-Hill Education.

PPD-103(iv): LUBRICATION AND BIOMATERIALS

Course Code: PPD-103(iv) Course Credits: 4.0 Contact Hours: 4 hours/week (4 Lectures) Examination Duration: 3 hours	**Course Assessment Methods:** **Internal Examination (30 marks):** *Two minor tests each of 20 marks will be conducted. The highest marks obtained by a student in any of the two minor examinations will be considered. Class performance will be measured through percentage of lectures attended (04 marks), Assignments, quiz, etc., (06 marks).* **End semester examination (70 marks):** *The examiner is required to set 9 questions in all. The first question will be compulsory covering the entire syllabus and consisting of 4 short answers type questions of 3.5 marks each. In addition to that, 8 questions have to be set consisting of 2 questions from each unit. A candidate is required to attempt 5 questions in all, selecting one question from each unit and the compulsory question No. 1. All questions carry equal marks.*

UNIT-I

Lubricants: Introduction, Oil viscosity, Viscosity temperature relationship, Viscosity index, Viscosity pressure relationship, Viscosity-shear rate relationship, Viscosity measurements, Viscosity of mixtures, Oil viscosity classification, Lubricant density and specific gravity, Thermal properties of lubricants, Temperature characteristics of lubricants, Other lubricants characteristics, Optical properties of lubricants, Additive compatibility and solubility, Lubricant impurities and contaminants, Solubility of gases in oils., Mineral oils, Synthetic oils, Emulsions and aqueous lubricants, Greases, Lubricant additives. Contact stresses, contact between two elastic spherical or spherical bodies, Elastohydrodynamic lubricating films, Micro-electro

hydrodynamic lubrication and mixed or partial EHL, Surface temperature at the conjunction between contacting solids and its effect on EHL, Traction and EHL.

Hydrodynamic and Hydrostatic Lubrication: Introduction, Reynolds equation, Pad bearings, Converging-diverging wedges, Journal bearings, Thermal effects in bearings, Limits of hydrodynamic lubrication, Hydrodynamic lubrication with non-Newtonian fluids, Reynolds equation for squeeze films, porous bearings. Hydrostatic bearing analysis, Generalized approach to hydrostatic bearing analysis, Optimization of hydrostatic bearing design, Aerostatic bearings, Hybrid bearings, Stability of hydrostatic and aerostatic bearings.

UNIT-II

Computational Hydrodynamics: Introduction, Non-depersonalization of the Reynolds equation, The Vogelpohl parameter, Finite difference equivalent of the Reynolds equation, Numerical analysis of hydrodynamic lubrication in idealized journal and partial arc bearings, Numerical analysis of hydrodynamic lubrication in a real bearing.

Boundary and Extreme Pressure Lubrication: Introduction, Low temperature-low load lubrication mechanisms, Low temperature-high load lubrication mechanisms, High temperature-medium load lubrication mechanisms, High temperature-high load lubrication mechanisms, Boundary and EP lubrication of non-metallic surfaces.

UNIT-III

Properties of the biomaterials and its processing, characterization, and applications: Introduction of biomaterials, Historical perspective on the development of biomaterials, Types of biomaterials, Basic properties of materials, Glass and Glass-Ceramics, Bone Morphogenetic Proteins. Stainless Steel, Co-based alloy, Cast CoCrMo, Wrought CoCrMo, Porous Coating for bone in growth, Ti-based alloys, Zr-Nb alloy, Ni-Ti alloy (Nitinol), Tantalum, Platinum-Iridium, Dental alloys, Biodegradable biomaterials. Bone Biomechanics, Cartilage biomechanics, Tendon and Ligament Biomechanics, Joint Biomechanics, Biomechanical Properties.

UNIT-IV

Metal Corrosion, Wear and Surface modification: Interaction of metallic biomaterials with the human body environment, Electro-chemical reactions on metallic biomaterials, Types of corrosion of biomaterials, Corrosion testing of biomaterials, Tribocorrosion, Bio-tribology.

Introduction of bio-friction, Lubrication and Wear, Wear classification and fundamental wear mechanisms, Wear in biomedical devices and biomaterials. Abrasive blasting, Plasma glow discharge treatment, Thermal spraying, Physical vapor deposition, Chemical vapor deposition (CVD), Electrical discharge machining, Powder and nano-particles mixed machining, LASER machining.

Books Recommended:

1. Stachowiak, G. W., & Batchelor, A. W. (2013). Engineering tribology (4th ed.). Oxford, UK: Elsevier.
2. Majumdar, B. C. (2020). Introduction to tribology of bearings (3rd ed.). New Delhi, India: S. Chand Publishing.
3. Halling, J. (2013). Principles of tribology (2nd ed.). London, UK: Macmillan.
4. Khonsari, M. M., & Booser, E. R. (2018). Applied tribology (3rd ed.). Hoboken, NJ: John Wiley & Sons.
5. Dorinson, R., & Ludema, K. (2023). Mechanics and chemistry in lubrication (2nd ed.). Amsterdam, Netherlands: Elsevier.
6. Bhushan, B. (2021). Principles and applications of tribology (3rd ed.). Hoboken, NJ: John Wiley & Sons.
7. Narayan, R. (2021). Biomedical materials (2nd ed.). Springer International Publishing.
8. Park, J., & Lakes, R. S. (2021). Biomaterials: An introduction (4th ed.). New York, NY: Springer.
9. Agarwal, C. M., & Ong, J. L. (2020). Introduction to biomaterials (2nd ed.). Cambridge, UK: Cambridge University Press.
10. Ratner, B. D., Hoffman, F. J., Schoen, A. S., & Lemons, J. E. (2013). Biomaterials science: An introduction to materials in medicine (3rd ed.). Amsterdam, Netherlands: Elsevier Academic Press.
11. Anandanatarajan, R. (2016). Biomedical instrumentation and measurements (2nd ed.) New Delhi, India: PHI Learning.

PPD-104: RESEARCH AND PUBLICATION ETHICS

Course Code: PPD-104 Course Credits: 2.0 Examination Duration: 2 hours	**Course Assessment Methods:** **Internal Examination (15 marks):** *Two minor tests each of 10 marks will be conducted. The highest marks obtained by a student in any of the two minor examinations will be considered. Class performance will be measured through percentage of lectures attended (02 marks), Assignments, quiz, etc., (03 marks).* **End semester examination (35 marks):** *The examiner is required to set 5 questions in all. The first question will be compulsory covering the entire syllabus and consisting of 5 short answers type questions of 3 marks each. In addition to that, 4 questions have to be set considering 2 questions from each unit. A candidate is required to attempt 3 questions in all, selecting one question from each unit and the compulsory question No. 1. Except Q. No. 1, all questions carry equal marks.*

UNIT-I

PHILOSOPHY AND ETHICS: Introduction to philosophy: definition, nature and scope, concept, branches. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

SCIENTIFIC CONDUCT: Ethics with respect to science and research. Intellectual honesty and research integrity. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP). Redundant publications: duplicate and overlapping publications, salami slicing. Selective reporting and misrepresentation of data.

PUBLICATON ETHICS: Publication ethics: definition, introduction and importance. Best practices/standards setting initiatives and guidelines: COPE, WAME, etc. Conflicts of interest. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice

versa, types. Violation of publication ethics, authorship and contributor ship. Identification of publication misconduct, complaints and appeals. Predatory publishers and journals.

UNIT-II

OPEN ACCESS PUBLISHING: Open access publications and initiatives. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies. Software tool to identify predatory publications developed by SPPU. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

PUBLICATION MISCONDUCT: (A) Group Discussion: Subject specific ethical issues, PFP, authorship. Conflicts of interest. Complaints and appeals: examples and fraud from India and abroad. (B) Software tools: Use of plagiarism software like Turnitin, Urkund and other open-source software tools.

DATABASES AND RESEARCH METRICS: Databases: Indexing databases. Citation databases: Web of Science, Scopus, etc. Research Metrics: Impact Factor of Journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score. Metrics: H-index, g-index, i10 index, altmetrics.

References

1. Bird, A. (2006). Philosophy of science. London, U.K.: Routledge.
2. MacIntyre, A. (2002). A short history of ethics: A history of moral philosophy from the Homeric age to the twentieth century (2nd ed.). London: Routledge.
3. Chaddah, P. (2018). Ethics in competitive research: Do not get scooped; do not get plagiarized (1st ed.). https://www.worldcat.org/isbn/9789387480865
4. National Academies of Sciences, Engineering, and Medicine. (2009). On being a scientist: A guide to responsible conduct in research (3rd ed.). Washington, DC: National Academies Press.
5. Resnik, D. B. (2011). What is ethics in research & why is it important. National Institute of Environmental Health Sciences, 1–10. https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm

6. Beall, J. (2012, September). Predatory publishers are corrupting open access. Nature, 489(7415), 179. https://doi.org/10.1038/489179a

7. Indian National Science Academy (INSA). (2019). Ethics in science education, research and governance (1st ed.). http://www.insaindia.res.in/pdf/ethics_book.pdf