



Government of Maharashtra
GOVERNMENT POLYTECHNIC NAGPUR
(An Autonomous Institute Of Govt. Of Maharashtra)

OBE CURRICULUM 2021
DIPLOMA IN TEXTILE MANUFACTURES



OUTCOME BASED CURRICULUM

2021

DIPLOMA IN

TEXTILE MANUFACTURES

The Program Structure and Curriculum Contents for Diploma in **Textile Manufactures** are approved in Advisory Board (AB), Programwise Board of Studies (PBOS), Board of Studies (BOS), And Governing Board (GB), Government Polytechnic, Nagpur.

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Principal
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VISION OF THE INSTITUTE

To become a Center of Excellence, providing quality technical education and training.

MISSION OF THE INSTITUTE

The mission of Government Polytechnic, Nagpur is-

1. To frame institutional policies for effective implementation of teaching learning process
2. To inculcate values and ethics for life-long learning through curricular, co-curricular and extra-curricular activities
3. To develop facilities and services for academic excellence.
4. To enhance the skills of faculties and staff through industry institute collaboration.

Vision of Program

Vision of the Textile Manufactures Program:

“To become a Centre of Excellence in imparting skill based Textile Technology Education.”

MISSION OF PROGRAM

Mission of the Textile Manufactures Program:

- M1:** To impart high quality Textile Technology education and professional ethics to students.
- M2:** To adopt the best pedagogical methods in order to maximize knowledge transfer
- M3:** To have adequate mechanisms to enhance understanding implementation of theoretical concepts in practice.
- M4:** To provide the best facility, infrastructure, and environment to the students and faculty members, creating an ambience conducive for excellence in Textile Technology education.

Program Educational Objectives (PEOs)

The Program Educational Objectives of (PEOs) Textile Manufactures Program are:

- PEO1:** To acquire a strong background in basic science, mathematics, engineering science and technical arts and ability to use these tools in Textile Technology process.
- PEO2:** To develop the ability to demonstrate technical competence in the field of Textile Technology process and develop solutions to the problems in Textile Technology process.
- PEO3:** To attain the qualities of professional leadership to deliver effectively in a multi-disciplinary team and domains.
- PEO4:** To produce technicians who ensures social responsibility and environmental concern.
- PEO5:** To attain professional excellence through life-long learning and produce technicians who ensure professional, ethical and moral behavior.

PROGRAM OUTCOMES (POS)

- PO1: Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
- PO2: Problem analysis:** Identify and analyse well-defined engineering problems using codified standard methods.
- PO3: Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
- PO4: Engineering Tools, Experimentation and Testing:** Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
- PO5: Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.
- PO6: Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
- PO7: Life-long learning:** Ability to analyse individual needs and engage in updating in the context of technological changes.

PROGRAM SPECIFIC OUTCOMES (PSOS)

- PSO1:** Select raw materials, machines, process parameters to impart desired quality of textile product and services at minimum cost.
- PSO2:** Apply new methods / management techniques to produce textile products.

GOVERNING BOARD OF GOVERNMENT POLYTECHNIC, NAGPUR

S.N.	Name of Members	Designation	Organization
1	Dr. D. V. Jadhao	Chairman	Jt. Director, Technical Education, R.O. Pune
2	Dr. M. B. Daigavane	Member Secretary	Principal, Government Polytechnic, Nagpur
3	Dr. V.R.Mankar	Member Representative Educational Institute	Principal, Government Polytechnic, Amravati
4	Mrs. Kanchan Mankar	Member Representative MSBTE	Deputy Secretary, Maharashtra State Board of Technical Education, RO, Nagpur
5	Shri. Jayant Paranjpe	Member Representative Industry	MD, Rutam Technocrats, Nagpur.
6	Dr. R.L. Shrivastava	Member Representative Industry	Chairman, Institution of Engineers (I), Nagpur Local Centre, Nagpur
7	Mr. Hemant Bal	Member Representative Industry	CEO, Indorama Synthetics (I) Pvt. Ltd. Butibori, Nagpur.
8	Mr. J.K.Wadhavan	Member Representative Industry	Director, Epsilon Cables Pvt. Ltd. MIDC Area, Hingna, Nagpur
9	Mr. Milind S. Kanade	Member Representative Engineering Association	Secretary, Federation of Industries Association of Vidarbha
10	Mr. Amol Pusadkar	Member Representative Industry	Senior Manager, Tata Advanced System Ltd. (TAL), MIHAN, Nagpur
11	Mr. Narendra Naktode	Member Representative Industry	General Manager, Bharat Broad Band Network Ltd. BBNL
12	Mr. P.S. Patankar	Member Representative Industry	Director, Patankar Consultant Pvt. Ltd. Nagpur
13	Mr. Pravin Chandak	Member Representative	Director, Gimar Cars Pvt. Ltd and

		Industry	Gimar Auto Venture and Partner Gimar Motors, Nagpur
14	Dr. S.S. Kedar	Member Representative NITTTR	Coordinator, NITTTR Extension Centre, Pune
15	Dr. Ajeet Singh	Member Representative AICTE	Assistant Director, AICTE-Western Regional Office, Mumbai

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S.No	Name	Designation in Board of Studies	Designation / Organisation
1	Mr. Sudhir P. Pathak	Chairman	Former Senior Vice President (Manufacturing, Supply Chain Management and Central Manufacturing Engineering) and Member of Apex Leadership Council, Mahindra & Mahindra
2	Dr. M. M. Renge	Member Representative From Industry	Technical Consultant, D.A. Power Solution, Nagpur
3	Mr. Ashok Kale	Member Representative From Industry	M.D., SANSTAR Microsystems Pvt Ltd., Nagpur
4	Dr. Sandeep Shirkhedkar	Member Representative From Industry	Director, IMAGIS Engineering Solutions Pvt. Ltd., Nagpur
5	Mr. Sandeep Darwhekar	Member Representative From Industry	Beta Computronics Pvt. Ltd., 10/1, IT Park, Parsodi, Nagpur 440022
6	Mr. V. G. Thakare	Member Representative From Industry	Director, Simsoft Technologies, Manish Nagar, Nagpur - 15
7	Smt. K. S. Mankar	Member Representative M.S.B.T.E.	Deputy Secretary, Regional Board of Technical Education, Nagpur
8	Mr. P. V. Rekhade	Member	Head of Department Mechanical Engineering, Government Polytechnic, Nagpur
9	Mr. Y. K. Chandarana	Member	Chief Coordinator CDC Cell and Head Applied Mechanics

			Deptt.
10	Dr. V. H. Mankar	Member	Head of Department Electronics and Telecomm. Engg., Government Polytechnic, Nagpur
11	Dr. G. K. Awari	Member	Head of Department Automobile Engineering, Government Polytechnic, Nagpur
12	Dr. N. V. Raut	Member	Head of Department Civil Engineering Government Polytechnic, Nagpur
13	Dr. M.V.Sarode	Member	Head of Department Computer Engineering Government Polytechnic, Nagpur
14	Mr. M. N. Gawande	Member	In charge , Curriculum Development Cell, Government Polytechnic, Nagpur

INSTITUTE LEVEL COMMITTEE FOR CURRICULUM 2021

Sr. No.	Name of Member	Actual Designation	Committee
1	Dr. R. V. Yenkar	Head of Department, Electronics and Telecommunication Department	Chairman
2	Mr. P. V. Rekhade	Head of Department, Mechanical Engineering Department	Member
3	Dr. G. K. Awari	Head of Department, Automobile Engineering Department	Member
4	Dr. V. H. Mankar	Head of Department, Electronics and Tele. Engg. Deptt. (I Shift)	Member
5	Dr. N. V. Raut	Head of Department, Civil Engineering Department (I Shift)	Member
6	Shri K. L. Meshram	Head of Department, Metallurgical Engineering Department	Member
7	Dr. M. V. Sarode	Head of Deptt, Computer Engg. Depp.	Member
8	Shri Y. K. Chandarana	Head of Department, Applied Mechanics Department	Chief CDC Coordinator
9	Dr. S. S. Baraskar	Controller of Examination	Member
10	Mr. A. M. Arekar	I/C Head of Department, Electrical Engineering Department	Member
11	Shri M. N. Gawande	Lecturer in Electrical Engineering	Member Secretary

PROGRAM WISE BOARD OF STUDIES (PBOS)

TEXTILE MANUFACTURES

Sr. No.	Name of the Expert	Designation in Board of studies	Designation /Organization
1	Dr. C.P.Kapse	Chairman	I/C HOD, Textile Manufactures Government Polytechnic, Nagpur
2	Mr. Laxminarayan Kaushik	Member (Industry)	Founder Director of Textile Professional LLP, Nagpur
3	Dr. Ganesh Kakad	Member (Academic)	HOD, Textile Engineering, JDIET, MIDC Area, Yavatmal
4	Mr. Harsh Ramteke	Member (MSBTE Nominee)	HOD, Textile Technology SASMIRA, Mumbai
5	Dr. S.G.Gaikwad	Member (Institute)	Lecturer in Textile Manufactures, Government Polytechnic, Nagpur
6	Mrs. Lipika S. Chakraborty	Member (Institute)	Lecturer in Textile Manufactures, Government Polytechnic, Nagpur
7	Mr. M.N.Gawande	Member Secretary	I/C Curriculum Development Cell, Government Polytechnic, Nagpur

NATIONAL EDUCATIONAL POLICY-2020

The fundamental principles that will guide both the education system at large, as well as the individual institutions within it are:

- 1. recognizing, identifying, and fostering the unique capabilities of each student**, by sensitizing teachers as well as parents to promote each student's holistic development in both academic and non-academic spheres;
- 2. according the highest priority to achieving Foundational Literacy and Numeracy** by all students by Grade 3;
- 3. flexibility**, so that learners have the ability to choose their learning trajectories and programmes, and thereby choose their own paths in life according to their talents and interests;
- 4. no hard separations** between arts and sciences, between curricular and extra-curricular activities, between vocational and academic streams, etc. in order to eliminate harmful hierarchies among, and silos between different areas of learning;
- 5. multidisciplinary and a holistic education** across the sciences, social sciences, arts, humanities, and sports for a multidisciplinary world in order to ensure the unity and integrity of all knowledge;
- 6. emphasis on conceptual understanding** rather than rote learning and learning-for-exams;
- 7. creativity and critical thinking** to encourage logical decision-making and innovation;
- 8. ethics and human & Constitutional values** like empathy, respect for others, cleanliness, courtesy, democratic spirit, spirit of service, respect for public property, scientific temper, liberty, responsibility, pluralism, equality, and justice;
- 9. promoting multilingualism and the power of language** in teaching and learning;
- 10. life skills** such as communication, cooperation, teamwork, and resilience;
- 11. focus on regular formative assessment for learning** rather than the summative assessment that encourages today's 'coaching culture';
- 12. extensive use of technology** in teaching and learning, removing language barriers, increasing access for Divyang students, and educational planning and management;
- 13. respect for diversity and respect for the local context** in all curriculum,

pedagogy, and policy, always keeping in mind that education is a concurrent subject;

14. full equity and inclusion as the cornerstone of all educational decisions to ensure that all students are able to thrive in the education system;

15. synergy in curriculum across all levels of education from early childhood care and education to school education to higher education;

16. teachers and faculty as the heart of the learning process – their recruitment, continuous professional development, positive working environments and service conditions;

17. a ‘light but tight’ regulatory framework to ensure integrity, transparency, and resource efficiency of the educational system through audit and public disclosure while encouraging innovation and out-of-the-box ideas through autonomy, good governance, and empowerment;

18. outstanding research as a corequisite for outstanding education and development;

19. continuous review of progress based on sustained research and regular assessment by educational experts;

20. a rootedness and pride in India, and its rich, diverse, ancient and modern culture and knowledge systems and traditions;

21. education is a public service; access to quality education must be considered a basic right of every child;

22. substantial investment in a strong, vibrant public education system as well as the encouragement and facilitation of true philanthropic private and community participation.

AICTE MODEL CURRICULUM- 2019

GLIMPSES:

AICTE has developed Model Curriculum for diploma programs in 2019. All courses are distributed in eight categories:

- 1) Basic Science Courses 2) Audit Courses 3) Humanities and Social Science Courses
- 4) Engineering Science Courses 5) Programme Core Courses 6) Programme Elective Courses 7) Open Elective Courses
- 8) Project Work, Seminar and Internship courses.

AICTE has made 10-14 weeks summer internships mandatory. Internships are educational and career development opportunities, providing practical experience in a field or discipline. The internship has to be meaningful and mutually beneficial to the intern and organisation. To make education holistic; sports, physical activities, values and ethics have been embedded in the curriculum.

Salient features of this model curriculum are enumerated as under:

- Reduced number of credits
- Introduction of Induction Program
- Introduction of Audit Courses on Sports & Yoga in first semester to inculcate the habit of physical and mental fitness right from beginning.
- Well defined learning objectives & outcomes for each course.
- Inclusion of courses on Environmental Science, Indian Constitution.
- Built-in flexibility to the students in terms of program elective and open elective courses.
- Mandatory internships (Combination of Industrial training and internship in social sector/Govt. organizations/Skill development centres/ NGOs/ rural developments etc.
- Course on Entrepreneurship and Startups to encourage entrepreneurial skills.
- To the extent possible, the weightage of theory and practical (in terms of contact hours) has been balanced.
- A list of experiments, with the objective clearly spelt out, is specified for each lab course.
- Provision of organising at least one expert lecture per semester for each branch by inviting resource persons from domain specific industry.

MSBTE CURRICULUM HIGHLIGHTS

MSBTE implemented I Scheme Curriculum from academic year 2017-18. This curriculum is Outcome Based Education Curriculum. Industry Identified Competencies are the focus area of each course curriculum. MSBTE has also included suggested activities for students in curriculum for every course. A students has to submit report of 5-6 pages on student centred activities. MSBTE also suggested to cover some portion of curriculum through open online courses which can accelerate attainment of course outcomes. MSBTE also included self-directed learning of 15-20% of course curriculum. Micro-project is one of the important features. MSBTE has also instructed teacher for creating opportunities and provisions for co-curricular activities. Course for recent trends in the corresponding branch of engineering is included in the curriculum.

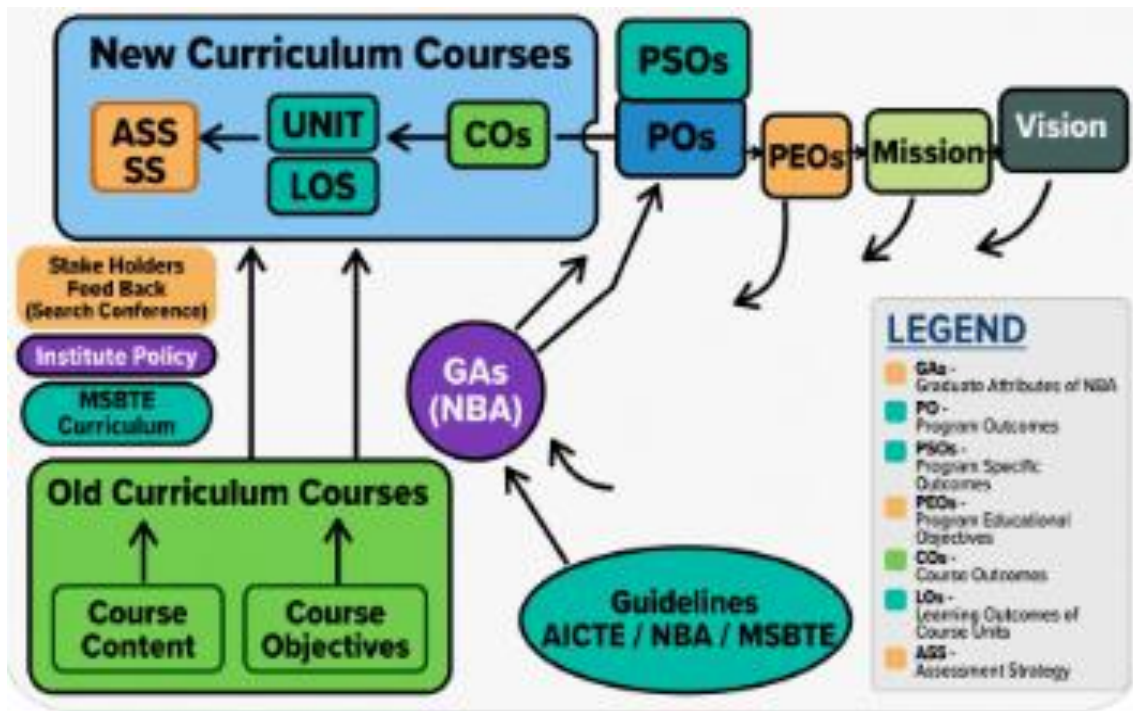
HIGHLIGHTS OF CURRICULUM 2021

Category wise Distribution of Courses

Sr.No	Category of Courses	No. of Courses in Programme
1	Humanities & Social Sciences Courses	05
2	Basic Science courses	04
3	Engineering Science Courses	05
4	Program Core courses	16
5	Program Elective courses	03
6	Open Elective Courses	01
7	Project, Internship Courses	02
8	Audit Courses	02
	Total	38

- Online courses available on SWAYAM (Study Webs of Active-learning for young aspiring minds), Spoken Tutorial and other equivalent digital platforms are offered to the students in each semester to the extents of 20% credit from total credit of all the courses being offered in the semester, The courses are designed on SWAYAM under the title MOOCS (Massive Open Online Courses) in which student will complete the courses on Online Platform and obtain a certificate and earn credit equivalent to the course available in Curriculum 2021 of the Institute.
- Internship for a complete semester is made compulsory.

CURRICULUM REVISION PROCEDURE



CURRICULUM REVISION PROCESS

Following Method is adopted for Development of Curriculum

- Implementing Outcome Based Education Philosophy
- Study OBE Curricula of Diploma in Engineering in India and Autonomous Institute (MS).
- Referred I-scheme curriculum of MSBTE, Mumbai.
- Study Model Curriculum of Diploma in Engineering curriculum by AICTE
- Compare 2016 curriculum with MSBTE existing curriculum
- Study NBA / AICTE / MSBTE / NSQF / NHEQF / NEP guidelines
- Organize Search Conference for validation of skills
- Collect Feedback (Program-wise) on existing curriculum from stake holders
- Curriculum mapping with POs to identify curriculum gaps
- Decide Institute Level policies

- Prepare Action Plan for development
- Analyse and Brain storming at program level
- Revise Vision, Mission and PEOs and curriculum at program Level
- Approve from PBOS, BOS and GB.

SEARCH CONFERENCE

The search conference is organized at institute level in the month of Feb 2021. The experts from the industries, academic institutions and alumni were present. The main objectives of organization of search conference are as follows:

- Validate generic and technical skills identified by the program.
- Suggest new skills to be developed in a technician pertaining to specific work area by industry/ field experts.
- Collect Feedback on existing curriculum and suggestions on previous received feedback.
- Suggest new course content to be incorporated in curriculum.
- Obtain suggestions on various topics related to program structure.
- Analyze and prepare a final list of generic skills and technical skills and from courses based on validated skills later on.

FORMATION OF COURSES

All the courses are formed on the basis of skills validated in search conference.

CURRICULUM MAPPING

The earlier curriculum is mapped to identify Program strengths (attributes that are widely addressed) and Gaps (attributes that are addressed by only a few learning experiences).

The simplest form of curriculum map is a matrix whose rows are the learning experiences (curriculum courses) and columns are the Graduate attributes (or Program Outcomes).

To establish the curriculum map, each faculty reviewed his/her courses and identified the attributes that are addressed in the course based on its content and materials.

INSTITUTE LEVEL POLICIES

Institute level policy for curriculum development is decided by the institute on the basis of followings:

- OBE Model
- Analysis of various curriculum Autonomous Institute / MSBTE curriculum / OBE curriculum
- NBA / AICTE / MSBTE / NHEQF / NSQF / NEP Guidelines
- Feed Back from stake holders
- Search Conference Outcomes
- Curriculum Mapping with 2016 curriculum
- Suggestions from PBOS / BOS and GB

SEARCH CONFERENCE – SKILLS VALIDATED FOR TEXTILE MANUFACTURES

Generic skills for Textile Manufactures Diploma Holder

- G1. Communicate in English in oral and written form.
- G2. Develop relevant soft skills and use them effectively in different day to day work.
- G3. Use relevant management concepts and principles in industry.
- G4. Prepare a project report for start-up in textiles.
- G5. Prepare tender documents and comparative statements.
- G6. Know computers fundamental applications and use them effectively for documentation, data analysis and presentations.
- G7. Develop self-confidence and explore creative thinking.
- G8. Actively participate in the group discussions and meetings.
- G9. Apply innovative skills in problem solving.
- G10. Follow ethical and moral values in professional practice.
- G11. Adapt time management skills in life.
- G12. Develop skills of providing feedback for improving the performance.

TECHNICAL SKILLS FOR TEXTILE MANUFACTURES DIPLOMA STUDENTS

- T1. Apply the principles of Physics for solving textile related problems.
- T2. Apply the principles of Chemistry for solving textile chemical processing related problems.
- T3. Apply the basic Mathematical principles to solve textile related calculations.
- T4. Prepare, read and interpret engineering drawings.
- T5. Use the basic principles of mechanical engineering to maintain textile machines and processes.
- T6. Apply the basic principles of textile technology in manufacturing of fibres, yarns and fabrics.
- T7. Recognize the physical, mechanical, chemical properties of synthetic and regenerated fibre.
- T8. Use basic principles of electrical engineering to maintain textile machines and processes.
- T9. Use basic principles of electronics engineering to maintain textile machines and processes.
- T10. Operate material handling equipment's related to textile manufacturing.
- T11. Use different types of textile pre-treatment machines for textile materials.
- T12. Use relevant dyes and chemicals for dyeing and printing of fibres, yarns and fabrics.
- T13. Understand the operations of dyeing, printing and finishing machines.
- T14. Undertake finishing processes for cotton and synthetic textile materials according to end use.
- T15. Prepare textile colour designs by using principles of colour science.
- T16. Ensure quality during pre-treatment, dyeing, printing and finishing processes of fibres, yarn and fabrics.
- T17. Understand cost effectiveness of wet processing.
- T18. Identify different technical textiles for relevant applications

- T19. Identify different textile materials and their composition.
- T20. Know the norms of energy conservation and pollution reduction
Techniques for sustainable development.
- T21. Calculate the cost of textile end products.
- T22. Prepare the site selection plans for various textile industry.
- T23. Use jewellery and leather designing concepts in fashion technology.
- T24. Knowledge of weft and warp knitting technology.
- T25. Prepare spin plan and weave plan.
- T26. Prepare Standard Operating Procedure for textile end product.
- T27. Compile data for production planning.
- T28. Prepare composition of textile material for specific end uses.
- T29. Prepare and follow maintenance schedule of textile machineries.
- T30. Identify the causes and remedies of the quality deterioration of input and
Output product of yarn and weaving process.
- T31. Know the duties and responsibilities of manpower required and allocate
accordingly for textile processes.
- T32. Use of eco-friendly/ environmental friendly technological processes in
textiles.
- T33. Knowledge of recycling of synthetic material.
- T34. Calculate yarn realization and fabric value loss.
- T35. Analyze different fabric samples for its construction and fabric
particulars.
- T36. Use and implement TQM principles for assuring quality of products and
services in textiles.
- T37. Follow safe practices in production, operation and maintenance.

CURRICULUM 2021

CREDIT :-

Definition of Credit: **A unit by which the course work is measured.** It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

1 Hr. Lecture (L) per Week	1 Credit
1 Hr. Tutorial (T) per Week	1 Credit
1 Hr. Practical (P) per Week	0.5 Credit
2 Hours Practical (P) per Week	1 Credit

Distribution of Credit

Breakup of credit is given below for Diploma In Textile Manufactures.

Sr. No.	Category	Breakup of Credits
1	Humanities & Social Sciences Courses	12
2	Basic Science Courses	16
3	Engineering Science Courses	16
4	Program Core Courses (Branch specific)	60
5	Program Elective Courses (Branch specific)	12
6	Open Elective courses	02
7	Project and Internship Courses	17
8	Audit Courses (Environmental Science, Indian Constitution)	(non-credit)
	Total	135

1. Humanities and Social Science Courses

An integral part of an engineering education involves exposure to the study of the broader contexts within which technology and engineering practice operates. The Social Sciences and Humanities requirements engage engineering students in course work that will provide this broad exposure. These courses provides the student the structured opportunities to understand topics as: human behaviour; civil society; geopolitical phenomena; the creative, artistic, linguistic, philosophical, and symbolic cultural endeavours throughout human history; social, economic, and political conflict; and challenges surrounding global health. Because of the importance of good communication skills to success in all endeavours, each student should seek to enhance these skills by the Social Science and Humanities courses. This category of courses contains English, Life Skills, Business Communication, Industrial Management etc. By studying humanities and social sciences, a student will have the chance to think and respond to the existing issues that require an innate understanding of the key geographical, historical, economic, political, and societal factors involved. Furthermore an aspiring student will come to know these factors that seen so different from each other actually interrelates.

2. The Basic Sciences Courses

The Basic Sciences Courses are defined as the scientific disciplines of Mathematics, Physics, and Chemistry. They are called basic sciences because they provide a fundamental understanding of natural phenomena and the processes by which natural resources are transformed. Basic Science Courses must be intended for science or engineering majors; introductory science courses are not acceptable. Basic science courses may be taken concurrently with regular courses. Basic science courses provide the background information so that technical elements can be more completely understood.

3. Engineering Science Courses

Engineering Science Courses are the courses which imparts essential knowledge of area which is common to multidiscipline of engineering. Engineering Science courses create awareness on different specializations of engineering studies. The goal of these courses is to create engineers of tomorrow, who possess the knowledge of all disciplines and can apply their interdisciplinary knowledge in every aspect.

4. Programme Core Course

Programme Core Course means a course that the student admitted to a particular programme must successfully complete to receive the diploma and which cannot be substituted by any other courses. Core courses are designed to maintain, improve, or expand skills and knowledge or to develop new and relevant skills and knowledge.

5. Programme Elective Course

Programme Elective Course means a course, which can be chosen from a list of electives and a minimum number of courses is required to complete the programme. These courses can be substituted, by equivalent course from the same subject. These courses and which may be very specific or specialized or advanced or supportive to the discipline.

6. Open Elective Courses

Open Elective Courses refer to the courses that students can opt for in addition to their primary area of study. These offer students greater autonomy over their curriculum, giving them the opportunity to customise it to reflect their passions and interests. Open Elective Courses are chosen generally from other discipline/ subject, with an intention to seek interdisciplinary exposure. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents of which are similar to that of their departmental core/elective courses. Student has to choose open elective course from the list of open electives list provided. The students can opt for MOOC courses for open elective under guidance of faculty.

7. Internship

Internship is a professional learning experience that offers meaningful, practical work related to a student's field of study or career interest. Internship provides practical knowledge to students. Internships are educational and career development opportunities, providing practical experience in a field or discipline. Internship is structured, supervised placements often focused around particular tasks with defined timescales. The internship has to be meaningful and mutually beneficial to the intern and the organization. Objectives of internship training:

Internship course

- a. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.

- b. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
- c. Exposure to the current technological developments relevant to the subject area of training.
- d. Create conditions conducive to quest for knowledge and its applicability on the job.

Learn to apply the Technical knowledge in real industrial situations.

- a. Expose students to the engineer's responsibilities and ethics.
- b. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
- c. Promote academic, professional and/or personal development.
- d. Expose the students to future employers.
- e. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
- f. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Project Course

The final year project signifies a milestone in an engineering student's life. It helps to bridge the gap between theory-based learning and skills-based learning. The projects fulfill the purpose of synthesizing the knowledge acquired during the years and demonstrating the student's aptitude by applying the knowledge. Every student must do one project in the Final year of their program. The minimum duration of project is 6 months. Students can do their project in Industry or R&D Lab or in house or combination of any two.

8. Audit Course

Audit Course means a Course which the student can register without earning Credits (zero Credit Courses). Extra learning is done by students in these courses for understanding social responsibility. The results of audit courses shall not be considered, however students need to complete audit courses for awarding the diploma.

Code

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
OE	Open Elective

Course level coding scheme:

Three-digit used as suffix with the Course Code for identifying the year of the course e.g.

101, 102 ... for first year

201, 202 ... for second year

301, 302 ... for third year

INTERNSHIP

OBJECTIVES

Internships are educational and career development opportunities, providing practical experience in a field or discipline. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
- Create conditions conducive to quest for knowledge and its applicability on the job.
- Learn to apply the Technical knowledge in real industrial situations.
- Gain experience in writing Technical reports/projects.
- Expose students to the engineer's responsibilities and ethics.
- Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
- Promote academic, professional and/or personal development.
- Expose the students to future employers.
- Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
- Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

BENEFITS OF INTERNSHIP

BENEFITS TO THE INDUSTRY

- Availability of ready to contribute candidates for employment.
- Year round source of highly motivated pre-professionals.
- Students bring new perspectives to problem solving.
- Visibility of the organization is increased on campus.
- Quality candidate's availability for temporary or seasonal positions and projects.
- Freedom for industrial staff to pursue more creative projects.
- Availability of flexible, cost-effective work force not requiring a long-term employer commitment.
- Proven, cost-effective way to recruit and evaluate potential employees.
- Enhancement of employer's image in the community by contributing to the educational enterprise.

BENEFITS TO STUDENTS:

- An opportunity to get hired by the Industry/ organization.
- Practical experience in an organizational setting.
- Excellent opportunity to see how the theoretical aspects learned in classes are integrated into the practical world. On-floor experience provides much more professional experience which is often worth more than classroom teaching.
- Helps them decide if the industry and the profession is the best career option to pursue.
- Opportunity to learn new skills and supplement knowledge.
- Opportunity to practice communication and teamwork skills.
- Opportunity to learn strategies like time management, multi-tasking etc in an industrial setup.
- Opportunity to meet new people and learn networking skills.
- Makes a valuable addition to their resume.
- Enhances their candidacy for higher education.

GOVERNMENT POLYTECHNIC, NAGPUR
DIPLOMA IN TEXTILE MANUFACTURES
TEACHING AND EXAMINATION SCHEME (CURRICULUM 2021)
FIRST SEMESTER TEXTILE MANUFACTURES

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TEE	CA	TEE	CA	
1	CH101G	Chemistry	Basic Science	3	-	2	4	60	40	25@	25	150
2	MH101G	Basic Mathematics	Basic Science	3	1	-	4	60	40	-	-	100
3	EN101G	English	Humanities and Social Science	2	-	2	3	30	20	25@	25	100
4	AM101G	Engineering Mechanics	Engineering Science	3	-	2	4	60	40	25@	25	150
5	IT151G	Introduction to IT systems(Online Course)	Engineering Science	-	-	-	2	-	-	25@	25	50
6	LS151G	Life Skills	Humanities and Social Science	-	-	2	1	-	-	-	25	25
7	EV151G	Environmental Science	Audit	2	-	-	-	-	Grade	-	-	Grade
8	IC151G	Indian Constitution	Audit	1	-	-	-	-	Grade	-	-	Grade
			Total	14	1	8	18	210	140	100	125	575

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation

** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of Class Course.

Student Centered Activity –Library -1 Hour, Sports- 2Hours,

Student Creative Activity-2 HoursSelf Learning Mode Through MOOCS/NPTEL/SWAYAM

GOVERNMENT POLYTECHNIC, NAGPUR
DIPLOMA IN TEXTILE MANUFACTURES
TEACHING AND EXAMINATION SCHEME (CURRICULUM 2021)
SECOND SEMESTER TEXTILE MANUFACTURES

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TEE	CA	TEE	CA	
1	MH104G	Applied Mathematics	Basic Science	3	1	-	4	60	40	-	-	100
2	EX101G	Fundamentals of Electrical and Electronics Engineering	Engineering Science	4	-	2	5	60	40	25@	25	150
3	PH101G	Physics	Basic Science	3	-	2	4	60	40	25@	25	150
4	TX101G	Fibre Opening and Cleaning	Core Course	3	-	2	4	60	40	25@	25	150
5	TX102G	Yarn Preparation for Weaving	Core Course	3	-	2	4	60	40	25@	25	150
6	EN151G	Business Communication	Humanities and Social Science	1	-	2	2	-	-	25@	25	50
7	WS151G	Engineering Workshop Practice	Engineering Science	-	-	4	2	-	-	25@	25	50
8	ME151G	Engineering Graphics	Engineering Science	-	-	4	2	-	-	25@	25	50
			Total	17	1	18	27	300	200	175	175	850

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation

** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of Class Course.

Student Centered Activity - Library -1 Hour, Sports- 2 Hours,

Student Creative Activity-2 Hours Self Learning Mode Through MOOCS/NPTEL/ SWAYAM

GOVERNMENT POLYTECHNIC, NAGPUR
DIPLOMA IN TEXTILE MANUFACTURES
TEACHING AND EXAMINATION SCHEME (CURRICULUM 2021)
THIRD SEMESTER TEXTILE MANUFACTURES

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TE E	CA	TEE	CA	
1	TX201G	Sliver Formation	Core Course	3	-	2	4	60	40	50#	25	175
2	TX202G	Yarn Sizing and Loom	Core Course	3	-	2	4	60	40	50#	25	175
3	TX203G	Pre Treatment and Finishing	Core Course	3	-	2	4	60	40	50#	25	175
4	TX204G	Fibre and Yarn Testing	Core Course	3	-	2	4	60	40	50#	25	175
5	TX205G	Fibre Science and Technology**	Core Course	3	-	-	3	60	40	-	-	100
Elective –I (Any One)												
6	TX206G	Garment Technology	Programme Elective	3	-	2	4	60	40	50#	25	175
	TX207G	Apparel Merchandising										
7	OE201G To OE222G	OPEN ELECTIVE**	Open Elective	2	-	-	2	30	20	50#	25	50
8	TX251G	Fabric Structure and Design	Core Course	1	-	4	3	-	-	50#	25	75
			Total	21	0	14	28	390	260	300	150	1100

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation

** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of Class Course.

Student Centered Activity - Library -1 Hour, Sports- 2 Hours,

GOVERNMENT POLYTECHNIC, NAGPUR
DIPLOMA IN TEXTILE MANUFACTURES
TEACHING AND EXAMINATION SCHEME (CURRICULUM 2021)
FOURTH SEMESTER TEXTILE MANUFACTURES

S r. N o.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Cred it	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Tota l Mar ks
				TE E	CA	TEE		CA				
1	TX208G	Roving and Yarn Formation [§]	Core Course	3	-	2	4	60	40	50#	25	175
2	TX209G	Dobby, Jacquard and Auto Loom [§]	Core Course	3	-	2	4	60	40	50#	25	175
3	TX210G	Dyeing and Printing [§]	Core Course	3	-	2	4	60	40	50#	25	175
4	TX211G	Advanced Fabric Structure [§]	Core Course	3	-	2	4	60	40	50#	25	175
Elective –II (Any One)												
5	TX212G	Advanced Yarn and Fabric Manufacturing	Programme Elective									
	TX213G	High Performance Fibre		4	-	2	5	60	40	50#	25	175
Elective –III(Any One)												
6	TX214G	Knitting Technology [§]	Programme Elective									
	TX215G	Textile Composite [§]		3	-	2	4	60	40	50#	25	175
7	ES351G	Entrepreneurship and Start up	Humanities and Social Science	2	-	2	3	-	-	-	25	25
			Total	21	-	14	28	360	240	300	175	1075

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation

** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of Class Course.

GOVERNMENT POLYTECHNIC, NAGPUR
DIPLOMA IN TEXTILE MANUFACTURES
TEACHING AND EXAMINATION SCHEME (CURRICULUM 2021)
FIFTH SEMESTER TEXTILE MANUFACTURES

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TE E	CA	TEE	CA	
1	TX301G	Process Control in Spinning ^{\$}	Core Course	3	-	2	4	60	40	50#	25	175
2	TX302G	Process Control in Weaving ^{\$}	Core Course	3	-	2	4	60	40	50#	25	175
3	TX303G	Fabric Testing ^{\$}	Core Course	3	-	4	5	60	40	50#	50	200
4	TX304G	Production Planning and Organization ^{\$}	Core Course	3	1	2	5	60	40	50#	25	175
5	TX305G	Technical Textiles	Core Course	4	-	-	4	60	40	-	-	100
6	AE213G	Industrial Management**	Humanities and Social Science	3	-	-	3	60	40	-	-	100
7	TX351G	Project ^{\$}	Project and Internship	-	-	4	2	-	-	100#	100	200
			Total	19	1	14	27	360	240	300	200	1125

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation

** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of Class Course.

GOVERNMENT POLYTECHNIC, NAGPUR
DIPLOMA IN TEXTILE MANUFACTURES
TEACHING AND EXAMINATION SCHEME (CURRICULUM 2021)
SIXTH SEMESTER TEXTILE MANUFACTURES

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs /Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TE E	CA	TEE	CA	
1	IN351G	Internship ^{\$}	Internship & Seminar	-	-	30	15	-	-	100#	100	200
			Total	-	-	30	15	-	-	100#	100	200

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation

** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of Class Course.

Teaching hours per faculty for internship -6hrs

AWARD OF CLASS FOR DIPLOMA IN TEXTILE MANUFACTURES

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)					Marks for Award of Class
				TH	TU	PR		Theory Marks		Practical Marks		Total Marks	
								TEE	CA	TEE	CA		
1	TX208G	Roving and Yarn Formation [§]	Core Course	3	-	2	4	60	40	50#	25	175	175
2	TX209G	Dobby, Jacquard and Auto Loom [§]	Core Course	3	-	2	4	60	40	50#	25	175	175
3	TX210G	Dyeing and Printing [§]	Core Course	3	-	2	4	60	40	50#	25	175	175
4	TX211G	Advanced Fabric Structure [§]	Core Course	3	-	2	4	60	40	50#	25	175	175
5	TX214G	Knitting Technology [§]	Programme Elective	3	-	2	4	60	40	50#	25	175	175
	TX215G	Textile Composite [§]											
6	TX301G	Process Control in Spinning [§]	Core Course	3	-	2	4	60	40	50#	25	175	175
7	TX302G	Process Control in Weaving [§]	Core Course	3	-	2	4	60	40	50#	25	175	175
8	TX303G	Fabric Testing [§]	Core Course	3	-	4	5	60	40	50#	50	200	200
9	TX304G	Production Planning and Organisation [§]	Core Course	3	1	2	5	60	40	50#	25	175	175
10	IN351G	Internship [§]	Project and Internship	-	-	30	15	-	-	100#	100	200	200
11	TX351G	Project [§]	Project and Internship	-	-	4	2	-	-	100#	100	200	200
			Total	27	-	54	55	540	360	650	450	2000	2000

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

DIPLOMA IN TEXTILE MANUFACTURES
LIST OF OPEN ELECTIVE

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TEE	CA	TEE	CA	
01	OE201G	Industry 4.0	Open Elective	2	-	-	2	30	20	-	-	50
02	OE202G	Disaster Management	Open Elective	2	-	-	2	30	20	-	-	50
03	OE203G	Introduction to E-Governance	Open Elective	2	-	-	2	30	20	-	-	50
04	OE204G	Cyber Securities and Laws	Open Elective	2	-	-	2	30	20	-	-	50
05	OE205G	Project Management	Open Elective	2	-	-	2	30	20	-	-	50
06	OE206G	Energy Waste Management	Open Elective	2	-	-	2	30	20	-	-	50
07	OE207G	Total Quality Management	Open Elective	2	-	-	2	30	20	-	-	50
08	OE208G	Modern Vehicle Selection	Open Elective	2	-	-	2	30	20	-	-	50
09	OE209G	Sustainable Development	Open Elective	2	-	-	2	30	20	-	-	50
10	OE210G	Renewable Energy Sources for Mobility	Open Elective	2	-	-	2	30	20	-	-	50
11	OE211G	Selection of Materials	Open Elective	2	-	-	2	30	20	-	-	50
12	OE212G	Non Destructive Testing	Open Elective	2	-	-	2	30	20	-	-	50
13	OE213G	Adventure Tourism	Open Elective	2	-	-	2	30	20	-	-	50
14	OE214G	Basic Guide Training	Open Elective	2	-	-	2	30	20	-	-	50
15	OE215G	Renewable Energy Technologies	Open Elective	2	-	-	2	30	20	-	-	50

16	OE216G	Energy Conservation Opportunities	Open Elective	2	-	-	2	30	20	-	-	50
17	OE217G	Electric Vehicle	Open Elective	2	-	-	2	30	20	-	-	50
18	OE218G	Artificial Intelligence	Open Elective	2	-	-	2	30	20	-	-	50
19	OE219G	Internet of Things	Open Elective	2	-	-	2	30	20	-	-	50
20	OE220G	Green Building	Open Elective	2	-	-	2	30	20	-	-	50
21	OE221G	Building Services	Open Elective	2	-	-	2	30	20	-	-	50
22	OE222G	Mechatronics	Open Elective	2	-	-	2	30	20	-	-	50

DIPLOMA IN TEXTILE MANUFACTURES

ABSTRACT OF CURRICULUM TEACHING AND EXAMINATION SCHEME

Sr. No.	Semester	Teaching Scheme (TH,TU,PR Hrs/Week) Total			Credit Total	Examination Scheme (Total Max.Marks)				
						Theory Marks		Practical Marks		Total Marks
		TH	TU	PR		TEE	CA	TEE	CA	
1	I	14	1	8	18	210	140	100	125	575
2	II	17	1	18	27	300	200	175	175	850
3	III	21	-	14	28	390	260	300	150	1100
4	IV	21	-	14	28	360	240	300	175	1075
5	V	19	1	14	27	360	240	300	200	1125
6	VI	-	-	30	15	-	-	100#	100	200
	Total	92	3	98	143	1620	1080	1275	950	4925

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN ME/AU/CE/EE/ET/MK/PK/MT/TX/IT/CM/MC/AI
COURSE CATEGORY	: BASIC SCIENCE COURSE
COURSE CODE	: CH101G
COURSE TITLE	: CHEMISTRY
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (Internal)
PT. EXAM	: 01 HR

❖ RATIONALE:

Chemistry is the basic science which is essential to all engineering courses. For an engineer, the usage of equipment's and instruments would require knowledge of chemical substances, their composition and properties. This course describes the basic facts, concepts & principles for the understanding of basic elementary knowledge related to all engineering fields. Chemistry subject knowledge also aims to bridge the theoretical concepts and their practical engineering applications, thus highlighting the role of chemistry in the field of engineering. This will be gateway for development of reasoning capacity of students and understanding new technology as well.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Use principles and basic laws of chemistry in engineering field.
2. Select and apply knowledge of metal and nonmetallic materials in field of engineering and Technology.
3. Select proper Engineering materials on the basis of properties and application.
4. Apply knowledge related with Electrochemistry, Cells and battery.
5. Use corrosion preventive measures in Industry.
6. Safely handle chemicals and equipment's which are correlate with safety of others and environmental protection

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Chemical Bonding & Catalysis	1. Explain electrovalence and covalence. 2. Explain the properties of given molecule based on the bond formation. 3. Differentiate between electrovalent and covalent bond. 4. Select the relevant catalyst for given application.	Valence: 1.1 Definition & types of valences (Electrovalence & Covalence). 1.2 Octet Rule, Duplet Rule. 1.3 Formation of Electrovalent e.g., NaCl, CaCl ₂ , MgO. 1.4 Formation of Covalent Compounds CO ₂ , NH ₃ , N ₂ 1.5 Distinction between electrovalent & covalent compounds 1.6 Catalysis: Types of catalysis, Catalyst, Types of Catalyst, Positive Catalyst, Negative Catalyst, Auto-catalyst, Industrial Application of Catalyst.	6
2. Metallurgy, Alloy & Polymer	1. Define terms related to metallurgy. 2. Explain different steps of metal extraction. 3. State purposes of alloy formation. 4. State composition properties and application of ferrous and nonferrous alloy 5. Distinguish between thermo softening and thermosetting plastics. 6. Explain the formation of Polymers. 7. Describe applications of Polyethylene & Bakelite plastic 8. State the applications of thermal insulators, Thermacole and Glass wool	2.1 Metallurgy: Definitions of terms used in metallurgy like Minerals, Ore, gangue, Flux, slag. Types of minerals and examples of minerals. 2.2 Definition of metallurgy, flow chart of extraction process (Crushing, Concentration (physical and chemical), reduction, refining). 2.3 Definition of alloy, purposes of alloy formation, Types of alloy (ferrous alloy and nonferrous alloy) 2.4 Composition properties and application of High speed steel, Magnetic steel, Duralumin, Woods metal. 2.5 Polymer (plastic): Definition of polymer, types of polymer and difference of thermo softening and thermosetting plastics. 2.6 Formation of Plastic by Addition polymerization of Polyethylene, polystyrene 2.7 Formation of Plastic by Condensation process Bakelite plastic, nylon 6, 6. 2.8 Insulating material: Definition & Characteristics of Thermal insulators. Preparation, Properties & Applications of Thermacole & glass wool.	8

3. Engineering Materials	Lubricant: 1. State functions of lubricants 2. Describe characteristics of Lubricants. 3. Select proper lubricant on the basis of different types of machines Water: 4. List the causes of hardness of water. 5. Describe the adverse effects hard water as per given industry. 6. Select the process of purification of portable water. Cement & Lime 7. Select appropriate materials used in construction. 8. Describe the properties and applications of cement and lime. 9. Mention the Applications of cement and lime.	Lubricant: 3.1 Definition, Types of Lubricants, Functions of Lubricants. 3.2 Characteristics of Lubricants- Viscosity, viscosity Index, oiliness, Volatility, cloud and pour point, Flash and fire point, Neutralization number. 3.3 Selection of Lubricant for various types of machines such as I.C engine, Gear system, cutting tools delicate and simple machines, tractors and rollers. Water: 3.4 Types of impurities in natural water. Definitions of hard and soft water, causes of hardness, types of hardness. 3.5 Adverse effects of hard water in: Industries- paper industry, textile industry, dyeing industry, sugar industry. 3.6 Potable water treatment: Sedimentation Coagulation, filtration, sterilization (Chlorination method). Cement & Lime 3.7 Portland cement: Definition, chemical composition. 3.8 Special Cements: Properties and application of water proofing cement, super sulphate cement. 3.9 Classification of lime: Composition, properties and uses of fat lime, lean lime.	10
4. Electrochemistry	1. Define terms involved in electrochemistry. 2. Describe the mechanism of electrolysis. 3. Identify the role of electrodes in application of electrolysis. 4. Define pH and calculate the pH of solutions with given concentration. 5. Differentiate Primary and Secondary cells. 6. Explain construction and working of Dry cell and Hydrogen-	Basic concepts of electrolysis: 5.1 Atoms, Ions, Electrolyte, conductivity of electrolytes, type of electrolyte- strong and weak electrolyte. 5.2 Ionization and electrolytic dissociation, Arrhenius theory of electrolytic dissociation, degree of ionization, factors affecting degree of ionization. Electrolysis 5.3 Mechanism of electrolysis- NaCl solution 5.4 Faraday's laws of electrolysis: Faraday's First and Second law (Statement and mathematical expression) 5.5 Application of electrolysis: Electro refining of copper. pH and p OH: 5.6 Definition of pH, pOH, pH scale, numerical. Electrochemical cells/ batteries:	9

	oxygen fuel cell. 7. Describe the Hydrogen- oxygen fuel cell.	5.7 Basic concepts: cell, battery, electrolytic cell, electrochemical cell 5.8 Classification and distinction of electrochemical cells: Primary and secondary cells. 5.9 Primary cells: construction, working and applications of – Dry cell, 5.11 Fuel cell: Definition, construction, working, advantages, limitations and applications of Hydrogen- oxygen fuel cell.	
5. Corrosion	1. State mechanism of atmospheric corrosion and immersed corrosion. 2. Describe different methods of protection of metal from corrosion. 3. Select proper protection method for different types of material from corrosion	6.1 Definition of corrosion, Types of corrosion, mechanism of Atmospheric or chemical corrosion. Effect of oxide film on atmospheric corrosion. Factor effecting atmospheric corrosion. 6.2 Immersed Corrosion or Electrochemical Corrosion, definition, types and mechanism (Hydrogen evolution and oxygen absorption) 6.3 Factors Affecting Electrochemical Corrosion 6.4 Application of Protective Coatings like metal coating by - Galvanizing, Tinning, Sherardizing, Metal Spraying, Metal Cladding.	7
6. Energy & pollution control	1. Compare different types of Fuel- solid, liquid and gaseous. 2. State significance of Proximate analysis of a fuel. 3. State significance of Biogas, LPG and CNG. 4. Describe causes and sources of pollution. 5. Select pollution control methods.	Energy 6.1 Definitions of a fuel, Classification of fuels with suitable examples Characteristics of a good fuel, calorific value and ignition temperature, comparison between solid, liquid, gaseous fuels based on their properties. Classifications of fuel: 6.2 Solid fuels: analysis of solid fuels- Proximate analysis for determination of moisture, volatile matter, ash and fixed carbon, significance of Proximate analysis. 6.3 Liquid fuels: Bio diesel - properties, applications. 6.4 Gaseous fuels: Composition, properties, applications of LPG, CNG Pollution control 4.5 Definition of pollution – Types of pollution (Air, water pollution) solid waste management, 3R Concept, recycling of plastic. 4.6 waste generation and management, e-	8

		waste management, sustainable development – significance of Wind Energy, Solar Energy.	
Total Hrs.			48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Pra cti- cals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Explore the chemistry laboratory.	Energy & pollution control	02
2	Determine the percentage of Iron in given steel sample by redox titration. (OR) Determine the percentage of copper in given alloy sample.	Metallurgy Alloys & Polymer	02
3	Find the relation between loss in weight of aluminium strip in acidic and alkaline medium and rate of corrosion	Corrosion	02
4	Determine the strength of given hydrochloric acid solution by titrating it against sodium hydroxide solution.		02
5	Determine the percentage of calcium content in cement	Engineering Materials	04
6	Determine the percentage of moisture and ash content in the given coal sample. by proximate analysis.	Energy & pollution control	02
7	Determine acid value of lubricant by KOH OR Determine coefficient of viscosity using Ostwald's Viscometer.	Engineering Materials	02
8	Prepare Phenol formaldehyde resin used in manufacturing of Bakelite Plastic.	Metallurgy Alloys & Polymer	02
9	Determine total hardness (permanent and temporary) of given sample of water by EDTA method.	Engineering Materials	04
10	Determination of PH value of given solution by using P ^H paper, universal indicator and PH meter.	Electrochemistry	02
11	Analyse basic and Acidic Radicals of known salt solution-1 (Confirmatory Test) using qualitative analysis method.	Chemical Bonding & Catalysis	02
12	Analyse basic and Acidic Radicals of known salt solution-2 (Confirmatory Test) using qualitative analysis method.		02
13	Analyse basic and Acidic Radicals of known salt solution-3 (Confirmatory Test) using qualitative analysis method.		02

14	Find the Electrochemical equivalent (ECE) of copper.	Electrochemistry	02
		Total	32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Chemical Bonding & Catalysis	02(02)	04(00)	02(00)	08(02)
2	Metallurgy, Alloy & Polymer	03(03)	05(03)	02(02)	10(08)
3	Engineering Materials	04(02)	07(06)	03(00)	14(08)
4	Electrochemistry	04(00)	05(06)	02(00)	11(06)
5	Corrosion	02(00)	03(06)	02(00)	07(06)
6	Energy and Pollution control	03(02)	06(03)	02(00)	10(06)
	Total	18(09)	30(21)	12 (06)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q.	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
No																			
1	2	U	2	3	R	2	3	R	2	4	R	2	4	R	2	5	R	2	6/9
	1	R	2	3	R	2	6	R	2										
2	4	U	3	5	U	3	6	R	3	2	R	3	3	U	3				3/5
3	1	U	3	3	U	3	6	U	3	2	U	3	3	U	3				3/5
4	1	U	3	2	U	3	6	U	3	4	U	3	5	U	3				3/5
5	3	U	3	2	U	3	3	A	3	5	U	2	6	U	3				3/5
6	1	A	2	3	U	2	2	A	2										2/3
	2	A	2	4	U	2	3	U	1										
	5	A	2	4	A	2	4	U	3										

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assign-ments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Writing chemical reactions, handling the equipment, writing procedure etc.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs (if any)	10
5	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3									
2	3	3		3						
3	3			3	3		3			
4	3	3		3			3			
5	3	3	2	3	3					
6	3		2	3	3		3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Engineering Chemistry Jain and Jain	Engineering Chemistry Jain and Jain, Dhanpat Rai publishing company(P) ltd.15 edition	10092
2.	Engineering Chemistry	Engineering Chemistry S. S. Dara, S. Chand Publication	15 th Edition
3.	Engineering Chemistry	R. Sivakumar N. Sivakumar and Tata McGrawHill, edition10.	9780745- 328896
4.	Polytechnic Chemistry	Vedprakash Mehta, Jain brothers, 6 th Edition	13-9788183600134
5.	Industrial Chemistry	Goel Publication, 8 th Edition	81877224002

❖ **E-REFERENCES:**

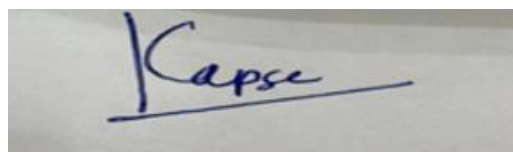
- ❖ http://www.substech.com/dokuwiki/doku.php?id=full_index_of_articles_on_polymers-, assessed on 10 June 2021
- ❖ http://www.substech.com/dokuwiki/doku.php?id=full_index_of_articles_on_fluids-, assessed on 10 June 2021
- ❖ <http://www.usetute.com.au/corrosion.html>, assessed on 10 June 2021
- ❖ http://www.sherardizing.com/resources/files/9_Sherardizing_Corrosion.pdf, assessed on 10 June 2021
- ❖ <http://www.galvanizeit.org/aga/animation>, assessed on 10 June 2021
- ❖ http://www.ehow.com/list_6725219_different-types-metal-cladding.html, assessed on 10 June 2021

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

1. Electronic balance (measure up to 0.001 mg)
2. Battery 12 volt
3. Digital multi-meter
4. Rheostat assorted sizes
5. Voltmeter MI 0-150-300 V
6. Ammeter MI 0-5-10 A
7. Electrolytic cell set up
8. Digital PH meter

LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM (786)

S.N.	Name	Designation	Institute / Industry
1.	Dr. M. I. Ahmed	Coordinator Sr.Lecturer in chemistry	Government Polytechnic, Nagpur
2.	Dr. S. A. Petkar	Lecturer in chemistry.	Government Polytechnic, Nagpur.
3.	Dr. K. A. Nandekar	Lecturer in Chemistry	G.H.Raisoni college of Engineering Nagpur
4.	Dr. Prashant Zade	Lecturer in Chemistry	Dharampeth Polytechnic, Nagpur
5.	Prashant B. Chouke	Lecturer in Chemistry	Government Polytechnic, Brahmpuri
6.	Dr. D.K.Borikar	Lecturer in Chemistry	Government Polytechnic, Nagpur
7.	Dr.S.L.Sayre	Lecturer in Chemistry	Government Polytechnic, Nagpur



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

**PROGRAMME : DIPLOMA IN CE/ME/AE/PK/MT/EE/EC/IT/CM/TX/
MC/AI**

COURSE CATEGORY: BASIC SCIENCE COURSE

COURSE CODE : MH101G

COURSE TITLE : BASIC MATHEMATICS

TEACHING SCHEME: TH:03; TU: 01(1TH/TU CREDIT=1CLOCK HRS.)

TOTAL CREDITS : 04

TH. TEE : 03 HRs

PR. TEE : --

PT. : 01 HR

❖ **RATIONALE:**

The course is classified under basic sciences and intends to teach students basic facts, concepts and principles of Mathematics as a tool to analyze Engineering problems. Mathematics lay- down the foundation for understanding core Technology courses.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to—

1. Apply laws of logarithm to solve engineering problems.
2. Resolve Proper real fractions into partial fractions.
3. Apply matrix method to solve simultaneous equations in two and three variables.
4. Use concept of allied angle, compound angle, multiple, and sub multiple angle to solve engineering problems.
5. Find principle value of inverse trigonometric functions, use properties to solve the examples of inverse trigonometric functions.
6. Use measures of central tendency and measures of dispersion in decision making.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Logarithm	1a. Evaluate the value of given logarithm without using calculator. 1b. Solve the given logarithm by using Laws of logarithm. 1c. Identify natural and common logarithm.	1.1 Logarithm:-Concept of Logarithm 1.2 Rules and Laws of Logarithm; Addition, Subtraction, Multiplication, Division and Change of Base Formula. 1.3 Concept of natural & common logarithm	03
2. Partial Fractions	2a. Identify rational function, proper and improper fraction. 2b. Resolve the given proper fraction into partial fraction. 2c. Resolve the given improper fraction into partial fraction.	2.1 Concept of rational function, proper, improper fraction and partial fraction 2.2 Resolving proper fraction into partial fraction. Denominator containing non repeated linear factors, Denominator containing repeated linear factors, Denominator containing irreducible non repeated quadratic factors 2.3 Resolving improper fraction into partial fraction.	05
3. Determinant and Matrix	3a. Find the value of given determinant of order 2 and 3. 3b. Solve the given matrix by using Algebra of matrix, transpose of matrix, adjoint of matrix, singularity of matrix and find inverse of matrix. 3c. Solve the given simultaneous equation in two and three variables.	3.1 Concept of determinant, order of determinant, Expansion & Evaluation of determinant of order 2 and 3 3.2 Concept of matrix, Types of matrices, Algebra of matrices Transpose of matrix, adjoint, singularity of matrix and inverse of matrix 3.3 Solution of system of linear equations two and three variables by inverse matrix method	12
4. Trigonometry	4a. Use fundamental identities to solve the given Trigonometric relation. 4b. Apply the concept of allied angle, compound angle, multiple angle (2θ and 3θ) sub-multiple angle ($\frac{\theta}{2}$), to solve the given trigonometric relation. 4c. Apply Factorisation, De-	4.1 Fundamental identities, Trigonometric ratios of any angle. 4.2 Trigonometric ratios of allied angles, compound angles, multiple and sub-multiple angles (without proof) 4.3 Factorization and de-factorization formulae (without proof).	14

	Factorisation formulae to solve the given trigonometric relations.		
5. Inverse Trigonometric Functions	5a. Find the principle value the given Inverse trigonometric functions. 5b. Solve the given inverse trigonometric functions. 5c. Evaluate the value of given inverse trigonometric functions.	5.1 Concept of inverse trigonometric functions, Principle values of inverse trigonometric functions. 5.2 Properties of inverse trigonometric functions. 5.3 Relation between inverse trigonometric functions	05
6. Statistics	6a. Find mean or Combined Mean of given Statistical data. 6b. Find the Range, Co-efficient of Range, Mean Deviation, Standard Deviation of given Statistical data. 6c. Find variances, coefficient of variation of given Statistical data. 6d. Compare the given Two sets and Check the Consistency & Reliability OR Interpret the result by co-efficient of variations.	6.1 Measures of central tendency Mean (only),& Combined mean 6.2 Measures of dispersion:- Range , mean deviation , standard deviation of Discrete, Grouped & Ungrouped Data. 6.3 Variance and coefficient of variation, of Discrete, Grouped & Ungrouped Data. 6.4 Comparison of two sets of observations ,Consistency & Reliability	09
		Total Hrs.	48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Assignments	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Solve examples using laws of logarithm.	Logarithm	01
2	Find partial fraction of proper fraction.	Partial fraction	01
3	Find partial fraction of improper fraction.		01
4	Expand determinant of order 2 and 3.	Determinant and Matrix	01
5	Perform all algebraic operations on matrices.		01
6	Find transpose , ad-joint and inverse of matrix.		01
7	Solve simultaneous equations in two and three variables.	Trigonometry	01
8	Verify trigonometric identities.		01
9	Use allied angle and compound formulae.		01
10	Use multiple and sub-multiple angle formulae.		01
11	Apply factorization formula to solve examples.		01
12	Apply de-factorization formula to solve examples.	Inverse trigonometric functions	01
13	Find principle values of inverse trigonometric functions and verify formulae.		01

14	Find mean of any data and combined mean of two sets of data.	Statistics	01
15	Find the range, mean deviation, standard deviation and variance.		01
16	Find coefficient of variation and compare the consistency.		01
Total Hrs.			16

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Logarithm	04(00)	00(00)	00(03)	04(03)
2	Partial Fraction	00(04)	03(00)	03(00)	06(04)
3	Determinant and Matrix	02(02)	06(03)	06(03)	14(08)
4	Trigonometry	02(00)	12(06)	06(06)	20(12)
5	Inverse Trigonometric Functions	02(00)	00(03)	03(00)	05(03)
6	Statistics	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	24(15)	24(15)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
1	1	R	2	1	R	2	2	R	2	2	R	2	3	R	2	3	R	2	6/9
	4	R	2	5	R	2	6	R	2										
2	2	U	3	3	U	3	3	U	3	1	A	3	2	A	3				3/5
3	3	U	3	4	U	3	4	U	3	4	U	3	3	A	3				3/5
4	4	U	3	4	U	3	4	U	3	4	A	3	4	A	3				3/5
5	5	U	3	6	U	3	6	U	3	5	A	3	6	A	3				3/5
6	3	A	6	4	A	6	6	A	6										2/3

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Who m	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcome s
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3, 4,5,6
		Class Room Assignment s		Tutorial Assignments	15	--	Assignme nt Book	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Stude nts	End of the Course	60	24	Theory Answer Sheets	1, 2, 3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				Total	--	--		
	TEE (Term End Examination)	End Exam	Stude nts	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Stude nts	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
	Nil	

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	-	-	-	-	-	-			
2	3	-	-	-	-	-	-			
3	3	-	-	-	-	-	3			
4	3	-	-	-	-	-	-			
5	3	-	-	-	-	-	-			
6	3	-	-	-	-	1	3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Higher Algebra	Hall & Knight, Publisher: Arihant, 6 th Edition 2021	9789351762539
2	Plane Trigonometry	S.L.Loney, Publisher: Arihant, 5 th Edition 2015	9352030540
3	Basic Statistics	B.L.Agarwal, Publisher: Anshan	1848290675
4	Basic Mathematics	G.V.Kumbhojkar, P. Jamnadas LLP., 21 st Edition 2017	978-81-934573-5-1
5	Fundamental of Statistics	S.C.Gupta, Himalaya Publishing House, 7 th Edition 2015	9789350517697

❖ E-REFERENCES:

- https://econtent.msbte.ac.in/econtent/econtent_home.php
- <https://www.khanacademy.org>
- https://www.youtube.com/watch?v=5_TuK1yCPD4

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Mr.S.M.Sayyed	I/C Mathematics Dept.	Govt. Polytechnic Nagpur
2	Mr.P.T.Khobragade	Lecturer	Govt. Polytechnic Nagpur
3	Mr.G.R.Dewalkar	Lecturer	Govt. Polytechnic Sakoli
4	Dr.P.B.Bahatkar	Professor	Y. C. C. E. Nagpur
5	Mr.W.T.Gaidhane	Lecturer	Nagar Parishad Junior College, Arvi

A photograph of a handwritten signature in blue ink on a white piece of paper. The signature appears to be 'Kapse' with a horizontal line extending from the end.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AI,CE,ME,EE,EC,PK,MC,MT,IT,AU,CM, TX,TR

COURSE CATEGORY : HUMANITIES & SOCIAL SCIENCE COURSE

COURSE CODE : EN101G

COURSE TITLE : ENGLISH

TEACHING SCHEME: TH: 02 TU: 00; PR: 02 (CLOCK HRs.)

TOTAL CREDITS : 03(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE : 02 HRs

PR. TEE : 02 HRs

PT. : 01 HR

❖ RATIONALE:

English as a means of communication and interaction is imperative in the holistic development of an individual. While giving a practical view of the world around him it also helps define well their role in the world. While teaching this course, emphasis will be laid on enhancing expression of ideas in English by the students. Excellence in this language enables a professional to develop his career as well as builds a strong standing in society.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Incorporate Grammatically correct structures in usage.
2. Acquire comprehension ability.
3. Assess the idea and information given.
4. Demonstrate usage of language effectively.
5. Formulate language into meaningful structures.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Application of Grammar	1a. Incorporate correct sentence pattern in writing and speaking. 1b. Identify & use tenses in various situation. 1c. Formulate direct and indirect speeches according to the situations. 1d. Draft multiple and meaningful sentences	1.1 Articles & Prepositions 1.2 Tenses: Appropriate uses of tenses in given situations. 1.3 Voice: use of active and passive voice. 1.4 Narration: direct & indirect speech	06
2. Text	2a. Interpret oral summary of topics read or heard. 2b. Adjust speed of reading. 2c. Follow oral instructions and explain them to others. 2d. Comprehend the lecture and make notes while listening. 2e. Inculcate ethical and inspirational values	2.1 Text: Learning to read fluently and to develop insight through. Selected prose prescribed in the text. 1. Dale Carnegie's : Six ways to make people like you 2. When Life gave me Lemons- Rashmi Raj 3. Two Gentlemen of Verona- A.J. Cronin 4. To be a Somebody, Remain a Nobody by K S Ram 5. Brief answers to questions: AI	09
3. Comprehension of Passage	3a. Articulate single or multiple sentences. 3b. Comprehend main ideas and demonstrate them. 3c. Analyze and assess the information and ideas gathered from the given articles.	Articles for reading 3.1 Be Remarkable 3.2 Our Muddled Generation 3.3 Employers look for potential Employees	06
4. Speaking Skills	4a. Apply correct pronunciations. 4b. Compose sentences with correct intentions and sense. 4c. Associate correct accent/stress to the	Sample situations for conversational practice 4.1 Introducing yourself and others. 4.2 Meeting and parting. 4.3 Requesting information 4.4 Inquiries and information. 4.5 Asking, Giving and Refusing	06

	given words.	4.6 Permission. Apologizing to an individual/ office.	
5. Writing Skills	5a. Develop and expand ideas into paragraphs. 5b. Exercise speeches as per given situation.	5.1 Paragraph writing: Elaborate and expand ideas, Types of paragraphs 5.2 Speech writing: Introducing the guests and vote of thanks.	05
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Perform Tense Busters -All levels(To be performed in language lab)	Application of Grammar	06
2	Transform given sentences into active and passiveVoice	Application of Grammar	02
3	Practice narration(Direct & Indirect Speech)	Application of Grammar	02
4	outline an introduction- for self & others	Speaking Skills	02
5	Build Vocabulary for different situations	Text	04
6	Read and make notes on given topic	Text	02
7	Write a paragraph on given topic	Writing Skills	06
8	Conduct a Book Review	Writing Skills	02
9	Practice Dialogue Writing & presentation	Writing Skills	02
10	Conduct Comprehension of Passage	Comprehension passage	02
11	Prepare Speech and Present: 1) Introduction of guests 2) Vote of thanks	Speaking Skills	02
	Total		32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Application of Grammar	02(00)	03(00)	00(02)	05(02)
2	Text	04(02)	06(03)	00(00)	10(05)
3	Comprehension of Passage.	02(00)	06(00)	00(00)	08(00)
4	Speaking Skills	00(00)	00(00)	03(04)	03(04)
5	Writing Skills	00(00)	00(00)	04(03)	04(03)
	Total	08(02)	15(03)	07(09)	30(14)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	2	R	2	3	R	2	1	A	2	2	R	2	4/6
2	2	U	3	3	U	3	1	U	3	2	U	3							3/4
3	4	A	3	2	U	3	3	U	3	5	A	3							3/4
4	5	A	4	4	A	4													1/2

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4,5
	TEE (Term End Examination)		Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5
				Total	25	10		
	TEE (Term End Examination)		Students	End Of the Course	25	10	Practical Answer Scripts	1,2,3,4,5
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5
	End of Course Survey			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Performance	05
2	Overall presentation of given assignment	05
3	Viva voce	10
4	Activity	05
	TOTAL	25

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	-	-	-	-	-	3			
2	3	-	-	-	3	-	3			
3	-	2	-	-	3	-	-			
4	-	-	-	-	3	-	3			
5	3	2	-	-	-	-	-			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	How to Win Friends and Influence people: Six ways to make people like you	Dale Carnegie, Rupa; First edition (20 May 2016)	978-8129140173
2	When life gave me lemons	https://storymirror.com/read/english/story/when-life-gave-me-lemons/krd7xe09 ,	
3	Two gentleman of Verona	A.J.Cronin, Oxford University Press 2013	
4.	To be a somebody remain a nobody	K.S.Ram[Author] Times of India [Publisher] 20edition December 2004	
5	Brief answers to questions: Artificial Intelligence	Stephen HawkingHodder&Stoughton, 16 October 2018	9781529345421
6	Our muddled generation.	Dinesh Kumar,Manish Sabharwal,Golden Harvest,	9788125059523

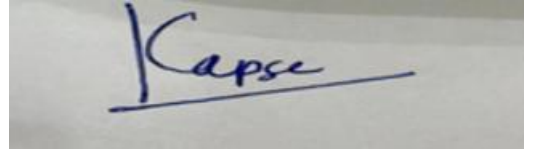
7	High School English Grammar and Composition	Wren and Martin Revised by Dr.N.D.V.PrasadaRao,	High School English Grammar and Composition
8	Contemporary English Grammar-structure and composition	David Green Revised Edition,2004 Himalaya Publication	033392183-6
9.	Interactive English	S.K.Gangal, Revised Edition 1997 Allied Publishers	81-7023-678-9
10	Applied English Grammar and composition.	Dr. P.C. Das, 2013, New Central Book Agency.	978-81-7381-542-3
11	English for Practical Purposes	Z. N. Patil, B.S. Valke	033935098

❖ E-REFERENCES:

- <https://storymirror.com/read/english/story/when-life-gave-me-lemons/krd7xe09>, Assessed on 25th July, 2021
- www.talkenglish.com-grammar , Assessed on 12th July, 2021
- www.perfect-english-grammar.com , Assessed on 18th March, 2021

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Dr.RupaliLondhe	Lecturer in English & Coordinator	Government Polytechnic, Nagpur.
2	Prof NitinPote	Expert, Lecturer in English	Government Polytechnic, Bramhapuri
3	Prof Ravindra Suryawanshi	Expert, Lecturer in English	NIT Polytechnic, Nagpur
4	Prof NitinPathak	Expert, Lecturer in English	Kamptee Polytechnic, Nagpur
5	Dr.M.M.Machale	Lecturer in English	Government Polytechnic, Nagpur.
6	Mrs. Kamala Grace	Visiting Lecturer in English	Government Polytechnic, Nagpur.
7	Mrs.Swati Mahatme	Visiting Lecturer in English	Government Polytechnic, Nagpur.
8	Ms.Rasika Joshi	Visiting Lecturer in English	Government Polytechnic, Nagpur.
9	Mrs.Barnali Roy	Visiting Lecturer in English	Government Polytechnic, Nagpur.



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/AE/PK/MT/MC/TX
COURSE CATEGORY	: ENGINEERING SCIENCE COURSE
COURSE CODE	: AM101G
COURSE TITLE	: ENGINEERING MECHANICS
TEACHING SCHEME	: TH:03;TU:00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH= 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TE EXAM	: 03 HRs
PR. TE EXAM	: 02 HRs (Internal)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Study of this course develops understanding of effect of force on a body. It helps in analytical and graphical solutions to problem related to forces acting on body. It also helps in understanding concept and application of Equilibrium, friction, centroid and centre of gravity. Study of simple machines gives idea about input, output, efficiency and friction of machine. Study of this course is very useful at higher level like strength of materials, Mechanics of Structure etc. It helps in forming base for understanding all the courses, which are related to engineering mechanics.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Apply concept of Units, Vector and Scalar Quantities.
2. Draw graph for law of various simple lifting machines.
3. Locate Centre of gravity and Centroid in various sections.
4. Apply concept of friction.
5. Illustrate effect of force, friction, centroid and centre of gravity.
6. Solve Problems related to force, equilibrium of forces, friction, centre of gravity and simple lifting machines.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Introduction of Engineering Mechanics	1. Define terms related to Engineering Mechanics 2. State the units of different scalar and vector quantity.	1.1 Definition of engineering mechanics, necessity and Classification of engineering mechanics. 1.2 Definitions: Space, time, particle, body, rigid body, mass, weight, scalar and vector quantity. 1.3 Units of measurement , Fundamental units and derived units.	02
2.Simple lifting Machine	1. Define terms related to simple lifting Machine 2. Describe different types of simple lifting machine 3. State velocity ratio of machines 4. Solve problem related to simple lifting machine	2.1 Concept of simple lifting machine, uses of machine, definition of load, effort, mechanical advantage, velocity ratio, efficiency of Machines, reversible and non-reversible machines.. 2.2 Ideal machine, friction in machine, law of machine, maximum Mechanical advantage and efficiency. 2.3 Velocity ratios of simple axle and wheel, differential axle wheel, Single purchase & double purchase crab winch, Simple screw jack, Weston's differential pulley block, geared pulley block, two sheaves and three sheaves pulley block, worm and worm wheel.	08
3.Forces	1. Define Terms Related to Force 2. Define terms related to moments 3. Define terms related to graphic statics 4. State Principal of Transmissibility of Force 5. State Law of parallelogram of forces 6. Describe Resolution & Composition of forces 7. Solve problems on forces.	3.1 Concept of force, definition of force, unit of force, effects of force, Characteristics of force. 3.2 System of forces. Principle of transmissibility of force. 3.3 Composition of forces & Resolution of forces (Two dimensional), Orthogonal and Non Orthogonal components of a force. Resultant force. Resultant of concurrent, non- concurrent and parallel forces, Law of parallelogram of forces: limitations and its applications 3.4 Definition of moment, sign convention of moments, types of moments. Law of moment, definition of couple, types of couple, properties of couple, Varignon's theorem of moment and its application. 3.5 Introduction to graphic statics, graphical representation of force, Bow's notation, Space diagram, force diagram, polar diagram & funicular polygon.	12

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
4. Equilibrium	1. Define terms related to Equilibrium 2. State analytical conditions of equilibrium. 2. State Lami's theorem 3. Define terms related to Beam 4. Solve Problems related to Lami's theorem and beam reaction.	4.1 Definition of equilibrium, analytical conditions of equilibrium, free body diagram 4.2 Lami's Theorem: limitations and its application. (Simple problems, no problems on spheres put in container). 4.3 Equilibrium of concurrent, non-concurrent and parallel forces. Definition of Beam, span, type of beams, type of supports, types of loading: point load and Uniformly Distributed Load. Analytical method to calculate reactions at support for point load and Uniformly Distributed Load on simply supported and overhanging beams	10
5. Centroid & Centre of gravity	1. Define centroid and center of gravity 2. State centroids of plain regular figures. 3. Locate centroid of two different geometric areas 4. Solve problems related to compound figures. 5. State the centre of gravity solid bodies 6. Locate c.g of two different solid bodies 7. Solve problems related to compound figures	5.1 Definition of centroid and centre of gravity, difference between centroid and centre of gravity. Locating centroid of regular figures such as triangle, rectangle, circle, Semi circle, quarter circle. (No Derivations). 5.2 Locating centroid of compound figures, having combination of two different geometric areas only. 5.3 Centre of gravity of solid bodies like cuboid, cylinder, cone, sphere and hemisphere. 5.4 Locating centre of gravity of compound bodies having combination of only two different geometric shapes.	08
6. Friction	1. Define terms related to friction 2. State laws of friction 3. Apply concept of friction 4. Solve problems related to friction	6.1 Concept of friction and its importance in engineering, types of friction, laws of friction, limiting equilibrium, limiting friction, co-efficient of friction, angle of friction, angle of repose, relation between co-efficient of friction and angle of friction. 6.2 Equilibrium of bodies on horizontal plane subjected to force parallel and inclined to the plane. Body resting on inclined plane subjected to force parallel to the plane. (No ladder friction).	08
Total Hrs.			48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
Group A (Any 10)			
01	Determine M.A., V.R., Efficiency of and law of machine for simple /Differential Axle and Wheel	Simple lifting Machine	2*
02	Determine M.A., V.R., Efficiency and law of machine for Simple Screw Jack		2*
03	Determine M.A., V.R., Efficiency and law of machine for Two Sheave Or three sheave Pulley Block		2
04	Determine M.A., V.R., Efficiency and law of machine for Single purchase Crab Or Double purchase Crab		2*
05	Determine M.A., V.R., Efficiency and law of machine for Worm and Worm Wheel		2
06	Verify law of polygon of forces	Forces	2*
07	Determine Forces in the members of jib crane.		2
08	Verify Lami's Theorem.	Equilibrium	2*
09	Verify Equilibrium of parallel forces using beam reaction apparatus.		2
10	Locate the centroid of plane lamina by method of suspension	Centroid and Centre of Gravity	2
11	Compare co-efficient of Friction between different surfaces such as Wood and wood, Wood and glass, Wood and metal.	Friction	2*
Group B (Any 02)			
12	Determine resultant of co-planer concurrent forces by graphical method. (Any two problems)	Force	04
13	Determine resultant of co-planer non-concurrent forces by graphical method. (Any two problems)		04
14	Determine beam reactions for Vertical Point Load and UDL by Graphical method. (Any two problems)	Equilibrium	04*
Total Hrs			32

- Experiments marked * are compulsory.
- Minimum 12 Practicals should be performed.
- The above list is suggestive and additional Practicals may be conducted if felt relevant by the course teacher.

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction	02(02)	00(00)	00(00)	02(02)
02	Simple Lifting Machine	02(02)	06(06)	00(00)	08(08)
03	Forces	02(02)	09(06)	06(00)	17(08)
04	Equilibrium	05(03)	06(03)	00(00)	11(06)
05	Centroid And Centre Of Gravity	02(00)	03(00)	00(06)	05 (06)
06	Friction	05(00)	06(06)	06(00)	17(06)
	Total	18(09)	30(21)	12 (06)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	4	R	3	6	R	3	2	U	3	4	R	3	2	U	3				3/5
03	2	U	3	3	U	3	3	U	3	2	U	3	3	U	3				3/5
04	3	U	3	4	U	3	4	U	3	3	U	3	4	U	3				3/5
05	5	U	3	6	U	3	6	U	3	6	U	3	6	U	3				3/5
06	3	A	6	6	A	6	5	A	6										2/3

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing figure of simple lifting machine and force diagram, selection of equipment's. writing procedure etc.	05
2	Performance	05
3	Calculation, Result, Drawing Graphs(if any)	05
5	Viva Voce	10
	TOTAL	25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	-	-	-	-	-	-			
2	3	2	2	3	-	-	-			
3	3	3	-	3	-	-	-			
4	3	3	-	3	-	-	-			
5	3	3	-	3	2	-	-			
6	3	3	-	-	3	-	-			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Applied Mechanics	R.S. Khurmi, S.Chand & Co. New Delhi, 2014	10:8121916437 13:9788121916431
2.	Engineering Mechanics	Sunil Deo, Label Book Publishers New Delhi, 2014	10:9381595550 13:978-938159558
3.	Engineering Mechanics	Basu, Tata Mcgraw Hills, 2013	10:125906266X 13:978-1259062667
4.	Engineering Mechanics	S Ramamrutham, S Chand & Co. New Delhi, 2008	8187433515 9788187433514
5.	Static and Straight of Materials	U.C. Zindal Asian Book Pvt. Ltd New Delhi, 2008	10:8184120737 13:9788184120730

❖ **E-REFERENCES:**

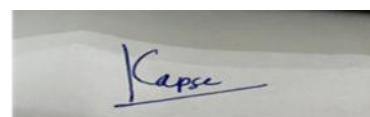
- ❖ <https://www.youtube.com/watch?v=-JG9IEqRzQ4> Accessed on 18th June 2021
- ❖ <https://www.youtube.com/watch?v=4VIhh6sGkrl> Accessed on 18th June 2021
- ❖ <https://www.youtube.com/watch?v=EcPGKLUe04I> Accessed on 18th June 2021
- ❖ <https://www.youtube.com/watch?v=ndT35aqDfAQ> Accessed on 18th June 2021
- ❖ <https://www.youtube.com/watch?v=W9UDs-kSR0g> Accessed on 18th June 2021
- ❖ <https://www.youtube.com/watch?v=kuAfu0fZOLw> Accessed on 18th June 2021
- ❖ <https://www.youtube.com/watch?v=Bx-mMA6k8u4> Accessed on 18th June 2021
- ❖ <https://www.youtube.com/watch?v=9XtGJXVnQxk> Accessed on 18th June 2021
- ❖ <https://www.youtube.com/watch?v=k37FJHbSQA8> Accessed on 18th June 2021
- ❖ https://www.youtube.com/watch?v=6_D6jjQcAFU Accessed on 18th June 2021
- ❖ <https://www.youtube.com/watch?v=AOkeQMMsSrc> Accessed on 18th June 2021

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

1. Simple /Differential axle and wheel
2. Simple Screw Jack
3. Two Sheave or Three sheave Pulley block
4. Single Purchase crab or double purchase Crab wheel
5. Worm and worm wheel
6. Force table apparatus for law of Polygon of forces
7. Jib crane by using triangle law of forces
8. Lamis theorem Force table apparatus
9. Inclined plane Apparatus

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
01	Y. K. Chandarana	HOD, Applied Mechanics	Govt. Polytechnic, Nagpur
02	A. Ateeque Azher	Lecturer in Applied Mechanics	Govt. Polytechnic, Nagpur



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN DIPLOMA IN CE/ME/EE/EC/CM/IT/
PK/MT/TX/TR/MC/AI

COURSE CATEGORY: ENGINEERING SCIENCE

COURSE CODE : IT151G

COURSE TITLE : INTRODUCTION TO IT SYSTEMS

TEACHING SCHEME: TH: 01; TU: 00; PR: 02(CLOCK HRs.)

TOTAL CREDITS : 02(1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)

TH. TEE EXAM : -

PR. TEE EXAM : 02 HRs (Internal)

PT. EXAM : -

❖ RATIONALE:

Information Technology (IT) is an essential tool that we cannot avoid as it plays an important role in our day to day life, especially in the present scenario. Introduction to IT Systems course starts with the basic computer skills, learning basic application software tools, Understanding Computer Hardware, Basic Internet awareness.

❖ COURSE OUTCOMES:

After completing this course students will be able to—

1. Apply the basics of computer fundamentals.
2. Identify Basic Internet skills.
3. Demonstrate the use of different Office Tools.
4. Recognize various computer hardware components.
5. Install, configure and maintain the operating system.
6. Identify and illustrate the use of Digital India portals (state and national portals).

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1.Introduction to Computer	1. Define Computer 2. State the application and use of computer 3. Describe History and Development 4. Identify Computer types	1.1 Terms: Computer, computation and its purpose 1.2 Application and use of computer 1.3 Classification of generations of computers 1.4 Supercomputers, Mainframe, Server, Work station, Personal Computer.	02
2.Basic Computer Organization	1. Define term Hardware & Software 2. Identify H/w & S/w Devices 3. State significance of computer case Components.	2.1 Peripherals: Input Devices ,Output Devices , Future Peripherals, Plug & Play Devices 2.2 Motherboard, Processor, Memory(RAM ,ROM), Disks 2.3 Storage Device: External storage devices, Internal storage devices Cloud Storage	02
3. Software	1. Define the Software & state its Need. 2. Identify types of software 3. State OS Installation steps. 4. Apply Windows/Linux Commands	3.1 System software 3.2 Application software 3.3 Firmware 3.4 OS Installation (Linux and MS Windows) 3.5 Internal and External DOS Commands.	02
4. Office Tools	1. Use document preparation system for composition, editing, formatting, and printing a document. 2. Demonstrate the use of Spreadsheet programs. 3. Prepare presentations using a presentation software 4. Illustrate A document preparation system-Latex	4.1 Introduction to a document preparation system-Google Doc/Word Processor 4.2 Spreadsheet programs:Microsoft Excel /Google Spreadsheet 4.3 Presentation software 4.4 Installation of Miktex and Texmaker 4.5 Overview of high-quality typesetting system i.e. Latex.	04
5. Basic Internet skills	1. Define terms related Internet 2. Describe Internet history 3. Use basic HTML to create a home page 4. Use 5. Email Management 6. Demonstrate the use of Blog ,Google Site, Google form	5.1 Terms: World Wide Web, Webpage, URL ,Website 5.2 Use navigational buttons: back, home, go, refresh, history 5.3 Search, navigate, and retrieve information from the World Wide Web 5.4 Perform basic e-mail functions, Manage Calendar, Contacts, and Tasks. 5.5 Blog ,Google Site, Google form	04

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
6. Emerging Trends	1. State Information security best practices. 2. Identify & Compare Web Portals 3. Familiar with social networking Sites and Tool. 4. Emerging Trends	6.1 Identify and Study different Ecommerce and E Governance Websites. 6.2 Digital India portals (state and national portals) and college portals. 6.3 Understand privacy issues in social networking Sites. 6.4 Artificial intelligence, Cloud Computing, The Internet of Things, Big data, Block chain.	2
Total Hrs.			16

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify hardware Components and look at those components in lab, identify them, recognize various ports/interfaces and related cables	1. Introduction to Computer	2
2	Connect various peripherals (printer, scanner, etc.) to computer; explore various features of peripheral and their device driver software.	2. Basic Computer Organization	2
3	Install Linux/ Windows operating system on identified lab machines; explore various options, do it multiple times.	3. Software	2
4	Use WordProcessor 1 Create a Blank Document 2 Check Spelling, Perform various operations on text like Font setting, delete, select, insert, copy- paste, cut-paste, find and replace. 3 Perform various page setup operations like paragraph setting, page margin, size, orientation, watermark, page borders. 4 Collaborate on Documents with Others 5 How to Use Google Docs Offline	4. Office Tools	4
5	Use Spreadsheet 1 Create a Spreadsheet and Fill It With Data 2 Add, Average, and Filter Data with Formulas 3 Perform various formatting operations like, Data Alignment, Wrap text, merge / unmerge cells, change column width, row height, setting page margin, size, orientation, print area. 4 Insert and remove cells, rows, columns. Draw various types of graphs / charts. 5 Perform various Functions on data in a worksheet like sum, average, count, countif, countblank, min, max, upper, lower, len, trim, left, right, mid, date, day, today, month, year, abs, int, exp, floor, sign, sum, sumif, sqrt	4. Office Tools	4
6	Use Google Doc Spreadsheet & Perform various operations	4. Office Tools	4

	on data in a worksheet like 1 Sort data in ascending and descending order, on one and more than one field. 2 Text Wrapping ,Text Rotation 3 Conditional Formatting 4 Create and Apply Filter and obtain desired data. 5 Split Text to columns, Remove duplicates,Trim Leading and Trailing Spaces		
7	Use Power point Presentation 1 Create Blank presentation, add /delete slides, insert /delete tables, word Art, header/footer, slide number, clipart, images in slide, hyperlink. 2 Select a theme, apply various slide transition methods, and apply animation effect, setup slide show, for selected slides.	4. Office Tools	4
8	Use Latex (Miktex) 1 Open/Create LATEX document using Texmaker 2 Write simple mathematical equations in LATEX document 3 Insert figures and tables in LATEX document 4 Generate the reports using templates	4. Office Tools	4
9	Create a Google form 1. Edit and format a form 2. Send your form for people to fill out 3. Choose where to save form responses 4. Analyzing the responses	5. Basic Internet skills	2
10	Using Google Drive 1 Create & Access Google site 2 Add Pages and contents to it 3 Customize and share	5. Basic Internet skills	2
11	Visit various e-governance/Digital India portals, E-Commerce,-Governance Websites&understand their features, services offered.	6.Emerging Trends	2
Total Hrs			32

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**Nil

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**Nil

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Class Room Assignments		Assignments	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Lab work is well-planned&organized, witheffective visualsand presentation(Application Design, Layout, labeling (if any))	10
2	Writing procedure etc.	10
3	Viva Voce	5
	TOTAL	25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:IT Dept.**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	3	--	--	--	--	3	3	--
2	3	3		--	--	--	3	3	--
3	3	3	3	3	--	--	3	3	--
4	3	3	--	3	--	--	3	3	--
5	3	3	--	3	--	--	3	3	--
6	3	3	--	--	--	--	3	3	--

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES: Other Dept.**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	3	--	--	--	--	3	--	--
2	3	3		--	--	--	3	--	--
3	3	3	3	3	--	--	3	--	--
4	3	3	--	3	--	--	3	--	--
5	3	3	--	3	--	--	3	--	--
6	3	3	--	--	--	--	3	--	--

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Computer Fundamentals	R.S. Salaria Khanna Publishing House	ISBN: 9789381068533
2.	Computer Course Made Easy	Ramesh Bangia Edition: 1	ISBN 13: 9789382609377
4.	Internet Applications	Ikvinderpal Singh	ISBN 10: 9381068399

❖ **E-REFERENCES:**

- <https://www.latex-tutorial.com/tutorials/> accessed on 22/6/2021
- <http://www1.maths.leeds.ac.uk/LaTeX/TableHelp1.pdf> accessed on 22/6/2021
- <https://www.wikihow.com/Create-a-Website-Using-Google-Sites> accessed on 22/6/2021
- <http://www.tutorialsforopenoffice.org/> accessed on 22/6/2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Computer System (with latest specifications)
2. MS Office 2007 Professional or latest version
3. PC tools
4. Windows 7

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. A R Mahajan	HoD, Information Technology	Government Polytechnic, Nagpur.
2	Mr. Dipak Dhote	Operations Manager, IT-Network Infosystems Pvt LTD	Industry Expert
3	Dr. Rakesh Kadu	Assistant Professor, I.T., Ramdeobaba College of Engg, and Management, Nagpur.	Member from Academics (External)
4	Mrs. V.A. Raje	Lecturer in C.O., G.P. Arvi	MSBTE Nominee
5	Mr. M.N. Gawande	Lecturer in Electrical Engg.	CDC In Charge and Member Secretary
6	Mrs. D.P. Chanmanwar	Lecturer in IT	Member (Internal)
7	Mr. L D Vilhekar	Lecturer in IT	Member (Internal), Course Expert
8	Mr. S J Pukale	Lecturer in IT	Course Expert



(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

**PROGRAMME : DIPLOMA IN CE/ME/EE/EC/CM/IT/MT/PK/AE/TR/
TX/MK**

COURSE CATEGORY : HUMANITIES & SCIENCE COURSE

COURSE CODE : LS151G

COURSE TITLE : LIFE SKILLS

TEACHING SCHEME : TH:00; TU:00;PR: 02 (CLOCK Hrs.)

TOTAL CREDITS : 01(TH/TU CREDIT = 0 , 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE EXAM : --

PR. TEE EXAM : --

PT. EXAM : --

❖ **RATIONALE:**

According to NASSCOM and other agency surveys conducted, suggests that today's Diploma engineers are technically solid, can do linear programming problems, solve issues quickly but lack in Interpersonal and Communication skills. The list of required life skills include communication, leadership, team work, public speaking, attitude, ethics, professional etiquettes etc. This 'disconnect' between the desired skills and the qualifications and skills obtained needs to be addressed. Bridging the gap between Formal technical education and Industry's requirements, an interface between Industry and Institute is very essential. A pre-employment training in these life skills therefore becomes the essential part of the curriculum of Diploma programmes. to prepare job ready students for industries. This will enhance the employability and the industry connect for the students and will reduce the gestation period of students in Corporate world.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Acquire knowledge of Self discovery.
2. Build essential soft skills.
3. Enhance professional competencies

4. Adapt ethics and values.
5. Develop interpersonal skills.
6. Maintain physical and mental fitness.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes(Cognitive Domain)	Topics and subtopics	Hrs
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S.No.	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	1. Prepare a draft of personal information. 2. Practice and perform self introduction. 3. Demonstrate appropriate body language during self intro and introducing others.	A. Soft Skills Understanding self & Others a. Self Introduction b. Introducing others	2 hrs
2	1. Practice Yoga Asanas recommended in AYUSH Common Yoga Protocol (Tadasana, Vrikshasana, Pada-hastasana, Trikonasana, Ardha-Chakrasana etc) for good health and fitness. 2. Prepare a diet chart for - Teenagers/Old age people/Diseased person etc. 3. Prepare a table of Do's and Don'ts of Habit formation.	B. Life Skills Mental & Physical Health a. Warm up b. Yoga c. Habit formation- Do's & Don'ts d. Diet Pyramid	4 hrs
3	1. Practice Pranayamas recommended in AYUSH Protocol (Anulom vilom, Kapalbhati, Bhramari Pranayama, Bhastrika, Surya Bhedan etc) for good health and fitness. 2. Practice different types of meditation -Mindfulness meditation, Loving Kindness Meditation , Yoga Meditation.	B. Life Skills Mental & Physical Health a. Pranayam b. Meditation	4 hrs
4	1. Practice and perform Group Discussions on topics/ issues of	A. Soft Skills Personality	2 hrs

	relevance. 2. Demonstrate appropriate dress and appearance for formal conversation. 3. Exhibit suitable non verbal codes of communication.	Development a. Group Discussion b. Personal grooming c. Verbal-Non Verbal communication	
5	1. Draft pros and cons on given topic of Debate. 2. Practice sessions on Debate on current affairs.	C. Employability Skills Interpersonal Skills a. Public Speaking b. Analytical thinking	2 hrs
6	1. Prepare draft for seeking permission to organize academic activity/event/visit etc. 2. Prepare checklist of things to do and schedule for organizing academic activity/event/visit etc. 3. Exercise activities (2 to 3) based on confidence building- such as Interviewing of field experts, organizing industrial visits and submitting reports etc.	C. Employability Skills Effective Management a. Planning b. Motivating self & others	4hrs
7	1. Jot down the qualities and skills of successful entrepreneur to prepare presentation on his/her achievements and contribution. 2. Prepare and present presentation on Learning lessons from Biographies of industrialists (like Rusy Modi, Dhirubhai Ambani, Ratan Tata, Narayana Murthy etc.	D. Presentation Skills - Corporate Culture a. Attitude b. Creativity & Innovation	4hrs
8	1. Investigate and examine industry related issues and prepare a case study on it. 2. Present case studies based on industry related issues like-indefinite labour strike, accidents , customer complaints, employees' career requirements.	D. Presentation Skills - Problem Solving a. Critical Thinking b. Problem Analysis	2 hrs
9	1. Jot down the lacunas of the entrepreneur which caused fall in business. 2. Prepare and present presentations on Learning lessons from failure business stories.	D. Presentation Skills - Learning Attitude a. Adaptability b. Persistence	2 hrs

10	1. Participate and practice in basket exercises / Games related to Team Working & Leadership. 2. Exhibit leadership qualities in group task.	A. Soft Skills Interpersonal Skills a. Working in a team b. Leadership	2hrs
11	1. Demonstrate exercises on Problem solving in Assertive communication (Role Play). 2. Incorporate assertive communication in given situation.	A. Soft Skills Interpersonal Skills a. Positive Thinking b. Assertiveness	2 hrs
12	1. Set short term and long term career goals. 2. Practice sessions on Time management (Prepare schedule to achieve short term and long term goals).	A. Soft Skills Effective Time Management a. Goal Setting b. Time Management	2 hrs
Total Hrs.			32

❖ **SPECIFICATION TABLE FOR THEORY PAPER: Nil**

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER: Nil**



❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)		--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments		--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course			Theory Answer Scripts	1,2,3,4,5, 6
			Students	Total				
Direct Assessment Practical	CA (Continuous)	Continuous Assessment of Practical		End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course			Practical Answer Scripts	1,2,3,4,5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Presentation Skills	10
2	Communication	10
3	Motivation	10
4	Confidence/Enthusiasm	05
5	Interpersonal Skills	10
6	Viva voce	05
Total		50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	-	-	-	-	-	2	3	-	-	-
2	-	-	-	-	-	2	3	-	-	-
3	-	-	-	-	-	3	3	-	-	-
4	-	-	-	1	1	3	3	-	-	-
5	-	-	-	-	-	3	3	-	-	-
6	-	-	-	-	-	2	3	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Yoga Therapy	Angarai, G. M. and Indra Mohan, Shambhala Publications, 2 nd Edition, January 1, 2014.	ISBN-13 9781590301319
2	The ACE of Soft Skills: Attitude, Communication and Etiquette for Success	Gopalaswamy R. and Mahadevan Pearson Publication, 1 st Edition, 13 May 2010.	ISBN-13 978-8131732854
3	Simple Art of Business Etiquette: How to Rise to the Top by Playing Nice	Jeffrey L Seglin, Tycho Pr Publication, 12 January 2016	ISBN-13 978-1623156886
4	The Big Book of Team-Motivating Games	Edward Scannell and Mary Scannell, McGraw-Hill Education, 7 October 2009	-----

5	Team Building: Proven Strategies for Improving Team Performance	W. Gibb Dyer , Jeffrey H. Dyer , and William G. Dyer, 5th Edition, Jossey-Bass, 3 January 2013	ISBN-13 978-1118105139
6	How to Win Friends & Influence People	Dale Carnegie, Pocket Books October 1, 1998	ISBN-10 0671027034
7	Famous Industrialists: Famous Biographies for Young People	Sigmund A. Lavine, Literary Licensing, LLC, 13 October 2012	ISBN-13 978-1258497026
8	Why Entrepreneurs Really Fail	Buchia Nozer, Bloomsbury, October 1, 1998	ISBN-13 9789382951605

❖ E-REFERENCES:

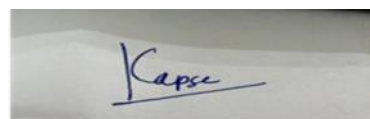
- <http://ihmshimla.org/wp-content/uploads/2013/05/Industrial-Training-Rule-Book.pdf>, accessed on 25th July, 2021
- <https://www.oliveboard.in/blog/from-rags-to-riches-indias-most-inspiring-success-stories>, accessed on 23rd May, 2021
- <https://coach.basketball.net.au/10-simple-team-building-activities-for-your-under-14s>, accessed on 14th June, 2021

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:

Nil

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Prof. Deepak Kulkarni	Soft Skills Trainer & Councilor	Consultant, Nagpur
2	Dr. Shabbir Zukerya	Director	Learner's Academy for Skill Development, Nagpur
3	Mr. Anand Toal	Director	International Placements, Nagpur
4	Dr. Megha Machale (Bhelande)	Lecturer in English	Government Polytechnic, Nagpur.
5	Prof. Yogesh Chandarana	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.
6	Mr. Manish Gawande	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : **DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/PK/MT/TX/TR/MC/AI**

COURSE CATEGORY: **AUDIT COURSE**

COURSE CODE : **EV151G**

COURSE TITLE : **ENVIRONMENTAL SCIENCE**

PREREQUISITE : **NIL**

TEACHING SCHEME: **TH: 02; TU: 00; PR: 00 (CLOCK HRs.)**

TOTAL CREDITS : **02 (2 TH CREDIT = 2 CLOCK HR.)**

TH. TEE : **NIL**

PR. TEE : **NIL**

PT. : **NIL**

❖ **RATIONALE:**

The world today is facing the biggest challenge of survival. Degradation of ecosystem, depletion of natural resources, increasing levels of pollution, poses major threat to the survival of mankind. The need of the hour, therefore, is to concentrate on the area of environmental science, which shall provide an insight into various environment related issues.

Environmental science is an interdisciplinary academic field that integrates physical and biological sciences, with the study of the environment. It provides an integrated, quantitative, and interdisciplinary approach to the study of environmental systems & gives an insight into solutions of Environmental problems.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Define the terms related to Environmental Studies.
2. Identify natural resources and problems associated with them.
3. Identify alternate energy resources and use them efficiently during their engineering practices.
4. State measures, to control various types of pollution, which will cause less harm to environment
5. Describe key issues about environment and create public awareness about those environmental issues.
6. Follow environmental ethics as lifelong learning.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. EARTH SYSTEMS AND RESOURCES	1. Name the historical events of earthquakes, volcanoes, Tsunami, cyclone & landslides in the world. 2. Identify problems associated with soil, water 3. Define weather and climate. 4. Describe the global water problems.	1.1 Earth Science: Concepts of Geologic time scale; earthquakes, volcanoes , Tsunami , cyclone & landslides 1.2 The Atmosphere: Weather and climate; the Coriolis Effect 1.3 Global Water Resources and Use: Present scenario, surface and groundwater issues; global problems; and its conservation. 1.4 Soil : soil erosion and other soil problems; methods of soil conservation	04
2.CONCEPT OF BIODIVERSITY	1. Define Biodiversity 2. List Levels of biodiversity 3. Define and list the biodiversity hotspots 4. List the endangered species 5. Prepare a report on value of Biodiversity 6. Suggest methods /steps for Biodiversity conservation	2.1 Definition of Biodiversity 2.2 Levels of biodiversity 2.3 Value of biodiversity 2.4 Threats to biodiversity, loss of biodiversity (biodiversity hotspots) 2.5 Conservation of biodiversity (modern methods of biodiversity conservation)	04
3. ENERGY RESOURCES & CONSUMPTION	1. List various forms of energy 2. Identify projects according to various energy forms 3. State advantages and disadvantages of various forms of energy 4. Select appropriate solutions for Efficient Use of energy 5. Suggest techniques for energy consumption to reduce impact on environment.	3.1 Energy Consumption history 3.2 Present global energy use, Future energy needs 3.3 Energy forms:(conventional and non conventional) 3.4 Energy Conservation 3.5 Renewable Energy: Solar energy; solar electricity; biomass; wind energy; ocean waves and tidal energy; geothermal	06
4. POLLUTION	1. Define pollution and	4.1 Definition of pollution. 4.2 Air pollution: Definition,	08

	pollutants - List the types of pollutants and their sources. - Suggest habits to reduce pollution - State the standard / limiting/ controlling values of various types of pollution.	Classification, sources, effects, Prevention and ambient air quality standards. 4.3 Water Pollution: Definition, Classification, sources effects, Prevention And WHO and BIS water quality standards. 4.4 Soil Pollution/land pollution: Definition, sources, effects, prevention 4.5 Noise Pollution: Definition, sources, effects, prevention. 4.6 Biomedical Waste and E-Waste - Origin, Effects and control Measures. 4.7 CPCB and MPCB norms and roles and responsibilities.	
5 SOCIAL ISSUES & ENVIRONMENT	- Define sustainable development - State sources of Green house effect, acid rains, Global warming - Describe the effect of Nuclear Accidents on environment.	5.1 Concept of development, sustainable development 5.2 Watershed management , rain water harvesting 5.3 Global Warming, greenhouse effect; ozone depletion, relevant laws and treaties 5.4 Nuclear Accidents and Holocaust: Basic concepts and their effect on climate, relevant laws and treaties	05
6. ENVIRONMENTAL EDUCATION	- Differentiate between formal and non formal environmental education - List the various Environmental Protection Act and their provisions - Suggest methods to develop awareness about environment.	6.1 Formal and non-formal education 6.2 Role of Govt. and Non-Govt. Organization 6.3 Indian constitutional provisions regarding the environment. Brief description of the following acts and their provisions: Environmental Protection Act and Prevention of Water, air and noise Pollution Act. 6.4. Concept EIA and environmental Ethics	05
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units
1	Prepare report on Loss of biodiversity, its conservation and also describe biodiversity hotspots.	Concept of Biodiversity
2	Prepare report on use of various renewable energy sources.	Energy Resources and Consumption
3	Collection of articles from news papers, magazines and internet on various types of environmental pollution.	Pollution
4	Prepare report on case study of Industrial /Nuclear / any other Disaster in India.	Social Issues And Environment

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Nil

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Nil

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Class Room Assignments		Assignments	20	08	Assignment Copy	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
				Total	20	08		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	One skill test at end of the End of Every Practical	--	--	Journal	--
		Journal Writing		Assignments	--	--	Journal	--
				TOTAL	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	-	-
2	3	3	-	3	-	-	3	-	-
3	3	3	-	3	-	-	3	-	-
4	3	-	-	3	2	-	3	-	-
5	3	-	-	3	-	-	3	-	-
6	3	-	-	-	2	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Environmental studies	Oxford University Press, New Delhi. 2011	0-19-807228-2
2.	Environmental Science	Y.K. Singh, New Age International, New Delhi	8122418481, 9788122418484
3.	A Text Book of Environmental Science	Arvind Kumar, APH Publishing, New Delhi	817648590X, 9788176485906
4.	Environmental Engineering	A Kamla & D.L.Kanth Rao, Tata Mc Graw-Hill, New Delhi	0-07-451708-2
5.	A Textbook of Environmental Studies	Shashi Chawla, Tata Mc Graw-Hill, New Delhi	9781259006388
6	Environmental studies	Erach Bharucha	UGC , New Delhi

❖ **E-REFERENCES:**

1. https://en.wikipedia.org/wiki/Lists_of_nuclear_disasters_and_radioactive_incidents, accessed on 20 April 2021
2. www.legalserviceindia.com/articles/noip.htm accessed on 20 April 2021
3. <https://prezi.com/8mnz--ldkybc/apex-unit-1-earth-systems-resources/> accessed on 20 April 2021
4. <http://www.conserve-energy-future.com/AlternativeEnergySources.php>, accessed on 20 April 2021

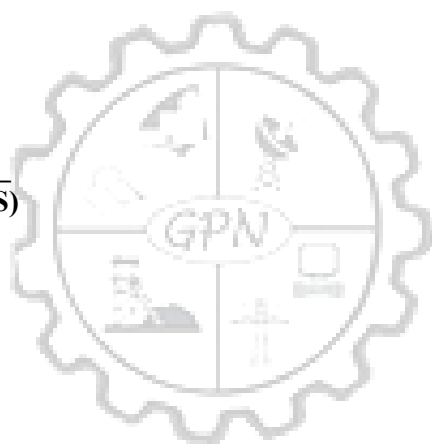
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr N V Raut	Head of Civil Engineering, (I Shift)	Government Polytechnic, Nagpur.
2	Dr S R Kukadapwar	Head of Civil Engineering, (II Shift)	Government Polytechnic, Nagpur.
3	Mr M R Shelote	Consulting Engineer	Shelote Associates ,Onkar Nagar ,Nagpur
4	Dr Mrs R A Wankhade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	Mr A J Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
6	Mr V B Dhait	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)



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GOVERNMENT POLYTECHNIC, NAGPUR.
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COURSE CURRICULUM

**PROGRAMME : DIPLOMA IN EC/IT/MC/EE/CM/CE/ME/AE/PK/
TR/TX/MT/AI**

COURSE CATEGORY: AUDIT COURSE

COURSE CODE : IC151G

COURSE TITLE : INDIAN CONSTITUTION

TEACHING SCHEME: TH:01; TU: 00;PR: 00(CLOCK HRs.)

TOTAL CREDITS : NIL

TH. TEE EXAM : -

PR. TEE EXAM : -

PT. EXAM : -

❖ **RATIONALE:**

The Constitution of India is the supreme law of India. The document lays down the framework that demarcates fundamental political code, structure, procedures, powers, and duties of government institutions and sets out fundamental rights, directive principles, and the duties of citizens. Engineer has to perform different works related to project planning, constructing project work, lead a group of workers etc. Engineer must also know about different bodies of administration, fundamental rights of citizen, different levels of Indian Union. Hence every Diploma Holder should have knowledge about Indian Constitution.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Outline structure of Indian Union
2. Interpret fundamental rights and duties of every citizen
3. Compare power and role of President and Prime Minister
4. List out functions of State Government, Central Government, District, Municipal, Zila Parishad
5. Classify different agencies involved in their job..
6. Apply knowledge related to constitution at different phases in their job.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. The Constitution - Introduction	1. Describe history of Indian Constitution 2. List out fundamental rights and duties of every citizen 3. Interpret state policies	1.1 The History of the Making of the Indian Constitution 1.2 Preamble and the Basic Structure, and its interpretation 1.3 Fundamental Rights and Duties and their interpretation 1.4 State Policy Principles	04
2. Union Government	1. Outline structure of Indian Union 2. Differentiate between and Rajya Sabha 3. Prepare a list of role and power of Prime Minister and President	2.1 Structure of the Indian Union 2.2 President – Role and Power 2.3 Prime Minister and Council of Ministers 2.4 Lok Sabha and Rajya Sabha	04
3. State Government	1. Differentiate between power of Governor and Chief Minister 2. Describe functioning of State Secretariat and different Ministries	3.1 Governor – Role and Power 3.2 Chief Minister and Council of Ministers 3.3 State Secretariat	03
4. Local Administration	1. Differentiate between powers and functioning of District Administration, Municipal Corporation and Zila Panchayat	4.1 District Administration 4.2 Municipal Corporation 4.3 Zila Panchayat.	03
5. Election Commission	1. Describe role and functioning of Chief and State Election Commissioner	5.1 Role and Functioning 5.2 Chief Election Commissioner 5.3 State Election Commission	02
Total Hrs.			16

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Assignment on each topic

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Class Room Assignments		Assignments	20	08	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Theory Answer Scripts	1,2,3,4,5,6
				Total	20	08		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End Of The Course	Questionnaires			

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	-	-	-	-	-	-	3	-	-	-
2	-	3	3	-	3	3	-	-	-	-
3	-	-	-	-	-	-	3	-	-	-
4	-	3	3	-	-	3	3	-	-	-
5	-	3	3	-	-	-	3	-	-	-
6	2	-	3	-	3	-	3	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Ethics and Politics of the Indian Constitution	Rajeev Bhargava, Oxford University Press, New Delhi, 2008	
2.	The Constitution of India	B.L. Fadia, Sahitya Bhawan; New edition (2017)	
3.	Introduction to the Constitution of India	DD Basu, Lexis Nexis; Twenty-Third 2018 edition	

❖ E-REFERENCES:

<https://www.constitution.org/cons/india/const.html>

<http://www.legislative.gov.in/constitution-of-india>

<https://www.sci.gov.in/constitution>

<https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr.D.D.Lulekar	HoD, Electrical Engg.Deptt.	Government Polytechnic, Nagpur.
2.	Mr.M.N.Gawande	Lecturer	Government Polytechnic, Nagpur

(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN TEXTILE MANUFACTURE

COURSE CATEGORY : BASIC SCIENCE COURSES

COURSE CODE : MH104G

COURSE TITLE : APPLIED MATHEMATICS

TEACHING SCHEME: TH: 03; TU: 01 (1 TH/TU CREDIT = 1 CLOCK HR.)

TOTAL CREDITS : 04

TH. TEE EXAM. : 03 HRs

PR. TEE EXAM : NIL

PT. EXAM : 01 HR

❖ RATIONALE:

Statistics has become an integral part of every branch of engineering. The knowledge of statistics is indispensable in modern world. It develops a skill of taking wise decision by analyzing the data in a scientific manner. Quality control of industrial products is one of the important contributions of statistics.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify the types of functions, and find the value of the given functions..
2. Apply methods to solve examples of limit of algebraic, trigonometric and exponential functions.
3. Apply probability theory in everyday life in the risk assessment and in trade on financial markets.
4. Apply the knowledge of probability to solve problems related to the production process.
5. Use statistical methods in the monitoring and maintaining of the quality of products and services.
6. Develop skills in choice of control chart, computation of control limits, plotting of chart, observations and conclusion.

A. COURSE DETAILS:**B. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Functions	1. Identify various types of functions. 2. Find the value of any given function.	1.1 Definition of function. 1.2 Value of a function. 1.3 Types of functions. 1.4 Even and odd function	04
2. Limits	1. Memorize the limit formula $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}$ 2. Evaluate limits of algebraic functions. 3. Evaluate limits of trigonometric functions. 4. Evaluate limits of exponential and logarithmic functions.	2.1 Concept of limit. 2.2 Algebra of limits. 2.3 Limits of algebraic functions. 2.4 Limits of trigonometric functions. 2.5 Limits of exponential & logarithmic functions.	08
3. Elements of probability theory	1. Define permutation and combination, factorial notation. 2. Define probability. 3. State addition theorem of probability. 4. Find probability using addition theorem of probability.	3.1 Mathematical preliminaries – Algebra of sets, Sub set., Null set, Intersection, Complement of set, Permutation and combination, factorial notation. 3.2 Definition of Random experiments, sample space, simple event, Probability of occurrence of an event, complement of an event, Theorem on probabilities on complementary events. 3.3 Definition of compound events – sum of two events , product of two events , addition theorem of probability, mutually exclusive events.	09
4. Probability distribution	1. Define Binomial, Poisson's and Normal distribution. 2. Solve examples based on Binomial, Poisson's and Normal distribution.	4.1 Binomial distribution, Mean, Standard deviation of a binomial distribution. 4.2 Poisson's distribution, Mean Standard deviation of a Poisson's distribution. 4.3 Normal distribution.	09
5. Tests of statistical significance	1. State Chi-square test for independence for attributes. 2. Solve examples based on Chi-square test for independence for attributes. 3. Solve examples based on Chi-square test for population variance. 4. Memorize formulae of 't' test, 'Z' test and 'F' test.	5.1 Definition of population parameter, sample, statistic, Definitions of a null hypothesis, an alternative hypothesis, type I error, type II error, level of significance, test of significance, test statistic, critical value, two sided alternative hypothesis, one sided alternative hypothesis. 5.2 Problem on large sample – One tailed, two tailed test for single proportion, test of significance for a single mean, test of significance for difference of mean. 5.3 Chi-square test - Chi-square test of goodness of fit, critical values, condition for	10

	5. Solve examples based on students 't' test. 6. Solve examples based on 'Z' test. 7. Solve examples based on 'F' test for equality population variances.	the validity of chi-square test. Chi-square test for independence for attributes degrees of freedom for $r \times s$ contingency table, $2 \times k$ contingency table, Chi-square test for population variance. 5.4 Students 't' distribution: definition, properties, application, test for single mean, assumptions for students 't' test, 't' tests for difference of mean. 5.5 'F' distribution – 'F' statistics, critical values, applications, 'F' test for equality population variances.	
6. Quality control	1. Memorize formulae for control limits of various charts. 2. Find control limits for various charts. 3. Draw P-chart, Np-chart, C-chart, X-chart and R-chart. 4. Draw conclusion.	6.1 Definition of quality, statistical quality control, control limits – upper, lower, central, 3-Sigma limits, Warning limits. 6.2 Control charts for attributes – P-chart, Np-chart, and C chart. 6.3 Control charts for variables – X-chart and R-chart	08
Total Hrs.			48

C. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Find value of any given function.	1. Functions	01
2	Find limits algebraic functions.	2. Limits	01
3	Find limits trigonometric functions.		01
4	Find limits exponential functions.		
5	Solve examples based on permutation and combination, factorial notation.	3. Elements of probability theory	01
6	Find probability of event.		01
7	Find probability using addition theorem of probability.		01
8	Find probability using addition theorem of probability.		01
9	Solve examples based on Binomial Distribution.	4. Probability distribution	01
10	Solve examples based on Poisson's distribution.		01
11	Solve examples based on Normal distribution.		01
12	Solve examples based on Chi-square (X^2) test.	5. Tests of statistical significance	01
13	Solve examples based on students 't' test.		01
14	Solve examples based on 'F' test for equality population variances.		01
15	Find control limits and plot P-chart, Np-chart, C-chart and draw conclusion.	6. Quality control	01
16	Find control limits and plot mean-chart and range chart and draw conclusion.		01

❖ SPECIFICATION TABLE FOR THEORY PAPER:

R-Remember

U-Understand

A-Analyze/Apply

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Functions	05(02)	03(03)	00(00)	08(05)
02	Limits	05(02)	03(03)	00(00)	08(05)
03	Elements of probability theory	03(04)	06(03)	03(00)	12(07)
04	Probability distribution	03(05)	03(03)	06(00)	12(08)
05	Tests of statistical significance	02(00)	03(00)	06(06)	11(06)
06	Quality control	03(02)	06(03)	00(00)	09(05)
	Total	21(15)	24(15)	15(06)	60 (36)

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	5	R	2	1	R	2	2	R	2	3	R	2	6/9
	3	R	2	4	R	2													
02	1	R	3	1	U	3	2	R	3	2	U	3	1	U	3				3/5
03	3	R	3	3	3	U	3	U	3	3	U	3	2	U	3				3/5
04	3	A	3	4	R	3	4	U	3	4	U	3	4	R	3				3/5
05	5	U	3	6	R	3	6	U	3	6	U	3	6	U	3				3/5
06	4	A	6	5	A	6	5	A	6										2/3

T- Unit/Topic Number

L- Level of Question

M- Marks

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3, 4,5,6
		Class Room Assignments		Tutorial Assignments	15	--	Assignment Book	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Scripts	1, 2, 3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				TOTAL	--	--		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course Survey			End Of The Course	Questionnaires			

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	3	-	-	3	-	-			
2	3	3	-	-	-	-	-			
3	3	-	-	-	3	-	-			
4	3	-	-	-	-	-	3			
5	3	-	2	2	3	2	3			
6	3	3	2	2	-	2	3			

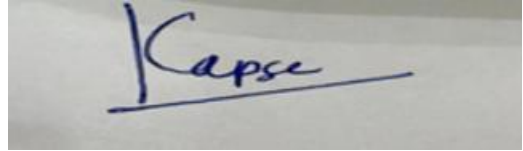
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Calculus of one variable	IA Maron, Publisher: Arihant, 5 th edition 2015	9352030559
2.	Probability & Statistics	Murray R Spiegel, Publisher: Tata Mcgraw Hill, 3 rd edition	0070151547
3.	Fundamental of Probability	Prem Kant Mishra, Pragun Publications	8183295681
4.	Fundamental of Probability: A first course	Das Gupta, Himalaya Publishing House, Edition 2010	9781441957795
5.	Fundamental of Statistics	S C Gupta, Himalaya Publishing House, 7 th edition 2015	9789350517697

❖ **E-REFERENCES:**<https://msbte.org.in/msbtelectures.html>,<https://www.khanacademy.org/math/probability><https://www.britannica.com/topic/statistical-quality-control>❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mr. S.M. SAYYED	I/C HOD, MATHS DEPTT.	GOVT. POLYTECHNIC NAGPUR
2.	Mr.P.T. KHOBRADE	LECTURER	GOVT. POLYTECHNIC NAGPUR
3.	Mr.G R. DEWALKAR	LECTURER	GOVT. POLYTECHNIC NAGPUR
4.	Mr. W.T.GAIDHANE	LECTURER	Nagar Parishad Jr. College ARVI
5.	Dr. P. B. BAHATKAR	PROFESSOR	Y. C. C. E. NAGPUR



(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN ME, TX, PK, MT, MC
COURSE CATEGORY	: ENGINEERING SCIENCE
COURSE CODE	: EX101G
COURSE TITLE	: FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (Internal)
PT. EXAM	: 01 HR

❖ RATIONALE:

All diploma engineering students should know the facts, concepts, principles and procedures in electrical & electronic engineering. This course describes the basic facts, concepts & principles for the understanding of basic elementary knowledge related to electrical area. It is very useful course for understanding the higher level knowledge in the field of electrical & electronic engineering.

❖ COURSE OUTCOMES:

After completing this course students will be able to—

SECTION 1 – Electrical Engineering

1. Identify different Electrical equipment and follow electrical safety rules.
2. Connect DC, AC circuits and electrical equipment.
3. Select suitable machine for particular application.

SECTION 2 – Electronics Engineering

4. Illustrate the working of Electronics components
5. Use semiconductor devices in Electronic circuits.
6. Use different Equipment / meters for measurement and testing of Electronic Circuits

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
SECTION 1 – Electrical Engineering			
1. Fundamentals of Electric, magnetic circuit and Electrical Safety	1. Define the various electrical Parameters, work, power and energy 2. Calculate the temperature coefficient of resistance 3. Define the term related to magnetic circuits 4. Apply electrical safety rules while working 5. Remove the electrocuted person from live conductor 6. Define fuses, relay and earthing.	1.1 Concept of Electric current, voltage, EMF and their SI units 1.2 Concept of Work, Electric power and energy and their SI units 1.3 Resistance, unit of resistance, Law of resistance, Effect of temperature on resistance, temperature coefficient of Resistance, Ohm's law. (Numerical Problems based on 1.3). 1.4 Concepts of magnetic circuits and Faraday's laws of electromagnetic induction 1.5 Causes of Electric accidents , Concept of electrical shock, Method of Removing Electrocuted person, General Electric safety rules 1.6 Earthing - Necessity of earthing, types of earthing. 1.7 Purpose of fuse , relay and circuit breaker in electric Circuit	08
2. DC and AC Circuits	1. State properties of series And parallel resistive circuits 2. Define terms related to AC fundamentals 3. Compare terms time period and frequency, angular velocity and frequency, frequency and speed. 4. Solve problems related to pure resistive, inductive and capacitive circuit	2.1 Concept of DC voltage & current. 2.2 Resistance in series and parallel, equivalent Resistance in series and parallel (Simple Numerical) 2.3 Generation of alternating voltage – Single phase and three-phase. 2.4 Voltage and Current relationship in Star and delta connection.(No numerical) 2.5 Equation of sinusoidal alternating voltage and current important terminology such as - waveform, instantaneous value, cycle, time period, frequency, amplitude, relation between time, period and frequency, angular velocity and frequency, Frequency and speed. (Simple Numerical based on 2.5) 2.6 A.C. voltage applied to pure resistor, pure inductor, and pure capacitor. Concept of reactance, Impedance and Power factor, power in single - phase Circuits. 2.7 Maximum, average and R.M.S. value of ac sinusoidal waveform	12

3. Transformer and Motors	1. State meaning of Transformer. 2. Describe the concept of transformation ratio, KVA rating of transformer, voltage regulation and efficiency 3. Classify different types of AC & DC motors. 4. Describe construction and working of DC Motor. 5. Describe construction and working of single & three Phase Induction motor.	3.1 Transformer:-Definition, principle of operation, types of transformer 3.2 EMF equation (No derivation), transformation ratio, KVA rating of transformer, voltage regulation and efficiency 3.3 Auto-transformer –Special features, Schematic diagram and its applications 3.4 Broad classification of A.C & D.C Motor 3.5 DC Motor- Working principle of D. C. motor. Types, selection for Different applications, reversal of rotation 3.6 AC Motor-Single-phase induction and Three phase induction motors, application and selection for different applications, reversal of rotation. 3.7 Concept of Electrical Drives & its block diagram 3.8 Stepper motor and Servo-motor- Working principle, construction, and its application	12
SECTION 2 – Electronics Engineering			
4. Semiconductor Theory, P-N Junction Diode & Zener Diode	1. Define terms related to Semiconductor. 2. Describe the Formation of PN junction 3. Draw & describe the Forward and reverse V-I characteristic of different diodes 4. Draw the symbols of different types of diodes 5. State the Principle of Operation of LED, Photodiodes. 6. State Specification of Diodes. 7. Apply Zener Diode as a Voltage regulator.	4.1 Definition& importance of Electronics. 4.2 Commonly used semiconductor – • Germanium, Silicon. • Intrinsic semiconductor, • Extrinsic semiconductors. • P-type and N-type semiconductors 4.3 PN junction, Formation of PN junction 4.4 Forward and reverse biasing. V-I Characteristics of PN junction diode. 4.5 Specification of diode. 4.6 Principle of operation, characteristics symbol of zener diode. 4.7 Application of Zener diode as a voltage regulator. 4.8 Photo Devices - Principle of operation of - • LED • Photo diode	12

2. Rectifiers and Filter Circuits	1. Define the terms related to Rectifier & filter. 2. Describe circuit diagrams and operation of Rectifiers & Filters. 3. Compare the difference between half and full Wave Rectifier. 4. Draw the waveforms of rectifiers & filter circuits 5. Describe the block diagram of DC regulated Power supply. 6. Describe the block Diagram of SMPS.	5.1 Definition and types of rectifier. 5.2 Circuit details, Operating principle, advantages and disadvantages of half wave Rectifier. 5.3 Circuit details, operating principle, advantages and disadvantages of Full wave rectifiers. Centre Tap Full Wave Rectifier Bridge Full Wave Rectifier 5.4 Definition of peak inverse voltage (PIV), Ripple factor, Rectification efficiency 5.5 Comparison of half and full wave rectifier 5.6 Necessity of filters and types of Filter. 5.7 Circuit diagram, operating principle and output waveforms of shunt capacitor CLC (PI) filter. 5.8 Block diagram of DC regulated power supply 5.9 Block diagram of SMPS. (Only block diagram no circuit details)	10
3. Bipolar Junction Transistor	1. Define the terms related to Transistor. 2. Identify PNP & NPN Transistor. 3. Describe the constructional details of Transistor 4. Describe the operating Regions of transistor. 5. List the application of transistor 6. Analyse the CE Circuit 7. Describe the operation of Transistor as amplifier.	6.1 Construction, operating principle and Symbol of PNP and NPN transistor. 6.2 CB ,CE and CC transistor configuration.(only circuit diagram) 6.3 Input and output characteristics of transistor in CE configuration 6.4 Definition of transistor parameter- • Input resistance, • Output resistance, • Current gains alpha and beta. 6.5 Applications of transistors. • Switch • Amplifier	10
Total Hrs.			64

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
SECTION 1 –Electrical Engineering			
1	a. Identify electrical measuring instruments, sources. b. Illustrate the different method to remove the electrocuted person from live conductor .	1. Fundamentals of Electric, magnetic circuit and Electrical Safety	2
2	Connect voltmeter, ammeter and wattmeter in electrical circuit.		2
3	Find unknown resistance using ohms law.	2. DC and AC Circuits	2
4	Find temperature coefficient of materials.		2
5	Calculate equivalent resistance of series and parallel circuit.		2
6	Determine the voltage and current ratio of single phase transformer	3. Transformer and Motors	2
7	Reverse the directions of rotation of DC shunt motor		2
8	Start Three phase Induction motor and reverse the direction of rotation		2
		Total Hours	16
SECTION 2 –Electronics Engineering			
1	i) Use the different front panel controls of CRO for Measurement. ii) Measure V _{pp} & Frequency for different waveforms generated from function generator on CRO.	1. Semiconductor or Theory, P-N Junction Diode & Zener Diode	04
2	Find the relation between voltage and current of PN junction Diode .Plot V-I characteristics of P-N junction diode.		02
3	i) Set the proper voltage & current limits with Controls in regulated power supply. ii) Measure voltage & currents using multimeter	2. Rectifiers & Filter Circuits	4
4	Connect Half-wave rectifier with filter and observe waveform with and without filter on CRO and draw the input and output waveforms. Find the average DC voltage for each.		2
5	Connect Full wave rectifier with filter and observe waveform with and without filter on CRO and draw the input and output waveforms. Find the average DC voltage for each.		2
6	Connect CE configuration of transistor as amplifier and observe the waveform. Calculate gain.	3. Bipolar Junction Transistor	2
Total Hours			16

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
SECTION 1 –Electrical Engineering					
01	Fundamentals of Electric, magnetic circuit and Electrical Safety	04(02)	03(03)	03(00)	10(05)
02	DC and AC Circuits	04(02)	03(00)	03(03)	10(05)
03	Transformer and Motors	04(02)	03(03)	03(03)	10(08)
SECTION 2 –Electronics Engineering					
04	Semiconductor Theory, P-N Junction Diode & Zener Diode	06(02)	03(03)	03(03)	12(08)
05	Rectifiers and Filter Circuits	02(02)	03(03)	03(00)	08(05)
06	Bipolar Junction Transistor	04(02)	03(00)	03(03)	10(05)
	Total	24(12)	18(12)	18(12)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER**

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
SECTION 1 –Electrical Engineering																			
01	1	R	2	2	R	2	1	R	2	2	R	2	3	R	2	3	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	2	U	3	1	A	3	3	A	3	2	A	3				3/5
03	3	U	3	3	A	3	2	A	3	1	U	3	3	U	3				3/5
SECTION 2 –Electronics Engineering																			
04	4	R	2	5	R	2	4	R	2	6	R	2	4	R	2	6	R	2	6/9
	4	R	2	5	R	2	6	R	2										
05	4	U	3	5	U	3	6	A	3	4	A	3	5	U	3				3/5
06	6	U	3	5	A	3	4	A	3	4	U	3	6	A	3				3/5

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram, selection of equipment. writing procedure etc.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs(if any)	10
5	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
SECTION 1 –Electrical Engineering									
1	3	-	-	2	2	-	3	-	-
2	3	-	-	-	-	-	2	-	-
3	3	-	-	2	2	-	3	-	-
SECTION 2 –Electronics Engineering									
4	3	3	-	-	-	-	-	3	-
5	3	3	-	-	-	-	2	3	-
6	3	3	2	2	-	-	-	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
SECTION 1			
1.	Principle of Electrical Engineering and Electronics	V.K.Mehta, S.Chand & Company Ltd., Reprint, 1996	81-219-1053-6
2.	A Text Book of Electrical Technology Vol-I	B.L.Theraja, A.K.Theraja, S.Chand & Co Ltd., Reprint,2006	81-219-2440-5
3.	Basic Electrical Engineering	V.N.Mittle, Arvind Mittal, The McGraw Hill Education Pvt. Ltd, Reprint, 2011	13: 978-0-07-059357-2
4.	Experiments in Basic Electrical Engineering	S.K.Bhattacharya and K.M.Rastogi., New Age International Publisher, Reprint, 2009.	978-81-224-1042-6
5.	A Text Book on laboratory courses in Electrical Engineering	S.G.Tarnekar and P.K.Kharbanda, S.Chand& Company Ltd., Third, 1990	13: 978-8121901048
SECTION 2			

1.	Principles of Electronics	V. K. Mehta, S. Chand & Company Ltd., Reprint, 1996	8121910536
2.	Electronic Principles	A.P. Malvino, Tata McGraw Hill, 8th edition	9780073373881
3.	Applied Electronics	R. S. Sedha, S. Chand & Co, revised edition, 2013	8121927838, 9788121927833
4.	Basic Electronics	Grob, Tata McGraw Hill, 12th edition	0073510859
5.	Electronics Devices & Circuits	S Salivahanan, Tata McGraw Hill, 2nd edition 2011	0074633864, 9780074633861

• **E-REFERENCES:**

SECTION 1

- <http://nptel.ac.in/courses/108108076/1> , assessed on 21th June 2021
- <http://www.electrical4u.com> , assessed on 21th Jun 2021 assessed on 21st June , 2021
- <https://library.automationdirect.com/basic-electrical-theory/> , assessed on 21st June , 2021
- <https://www.di.univr.it/documenti/OccorrenzaIns/matdid/matdid441904.pdf> , assessed on 21st June , 2021

SECTION 2

- www.learnelectronicsonline.com
- www.instructables.com/id/Basic-Electronics

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

SECTION 1

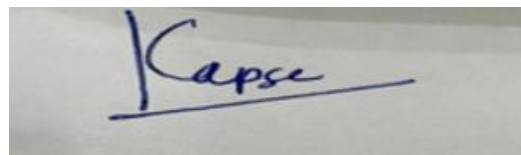
1. Ammeter MI 0-5-10 A
2. Voltmeter MI 0-150-300 V
3. Wattmeter 0-3000 W
4. Digital Multi-meter
5. Rheostat assorted sizes
6. Variable Inductor

SECTION 2

1. Ammeter MI 0-5-10 A
2. Voltmeter MI 0-150-300 V
3. Digital Multi-meter
4. Cathode ray oscilloscope- 0 to 50 MHz
5. Function Generator
6. Regulated Power Supply

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
SECTION 1			
1.	Dr.D.D.Lulekar	Chairman , PBOS & HOD Electrical Engg.Deptt.	Government Polytechnic, Nagpur.
2.	Mrs A.A.Alegaonkar	CDC Coordinator & Lecturer, Electrical Engg.Deptt.	Government Polytechnic, Nagpur
3.	Shri . M. C Musale	Expert & Lecturer in Electrical Engg.Deptt	Government Polytechnic, Nagpur
4.	Shri.M.N.Gawande	Expert & Lecturer in Electrical Engg.Deptt	Government Polytechnic, Nagpur
5.	Mrs.A.P.Gandhi	Expert & Lecturer in Electrical Engg.Deptt	Government Polytechnic, Nagpur
6.	Mrs.P.M.Sonwane	Expert & Lecturer in Electrical Engg.Deptt	Government Polytechnic, Nagpur
SECTION 2			
1.	Dr.V.H.Mankar	Head of Department (1 st Shift Electronics and Telecommunication deptt)	Government Polytechnic,Nagpur
2.	Prof.A.A.Ali	Head of Department (2 nd Shift Electronics and Telecommunication deptt)	Government Polytechnic,Nagpur
3.	Prof.V.M.Sakode	Lecturer	Government Polytechnic,Nagpur
4.	Prof.P.A.Meshram	Lecturer	Government Polytechnic,Nagpur
5	Prof.J.P.Kelwade	Lecturer	Government Polytechnic,Nagpur



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE ,ME, EE,EC, MC,IT, CM, MT,PK,AE,TX, MC, AI
COURSE CATEGORY:	BASIC SCIENCE COURSE
COURSE CODE	: PH101G
COURSE TITLE	: PHYSICS
TEACHING SCHEME:	TH:03; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs(Internal)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Physics is a fundamental science that endeavors to explain all the natural phenomena that occur in the universe. Studying physics will enable students to become citizens who are better informed about the world around them and who have the critical skills to evaluate and make evidence-based decisions about current scientific issues. The subject will also provide a foundation in physics knowledge, understanding and skills for those students who wish to pursue tertiary study in engineering and technology.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to—

1. Select proper measuring instrument on the basis of range and least count to measure physical quantities.
2. Apply the principles and laws of electricity and magnetism to solve engineering problems.
3. Use the basic principles of heat and optics for engineering applications.
4. Formulate, conduct and interpret experiments in physics.
5. Illustrate the basic physical concepts and terminology used in different fields of engineering.
6. Handle the instrument carefully to avoid any type of devastation.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1: General Properties of Matter	1. Identify least count and range of instruments. 2. State Hook's law of elasticity. 3. Define different terms related to elasticity. 4. Describe the types of modules of elasticity. 5. Define the terms related with general properties of liquid. 6. State the factors affecting surface tension and viscosity. 7. Select the laws of viscosity to find the coefficient of viscosity of freely falling body. 8. Classify the types of flow of liquid with significance of Reynolds's number. 9. Illustrate the phenomenon of Capillarity and angle of contact of liquid and glass. 10. Solve the numerical based on general properties of matter.	1.1 Elasticity, Plasticity, Rigidity. Stress and Strain with their types, Elastic Limit, Hook's Law, Types of modulus of Elasticity, Stress-Strain curve, Applications of elasticity. 1.2 Least count and range of instruments: Vernier caliper, outside micrometer screw gauge, travelling microscope. (Numerical based on above) 1.3 Surface Tension, Factors affecting surface tension, Molecular force, cohesive and adhesive force, Angle of contact with its significance and capillary action (no derivation), Application.(Numerical based on above) 1.4 Viscous force, Definition of viscosity, Newton's law of viscosity, Stoke's law, statement and formula (no derivation), Coefficient of viscosity and S.I. unit. Types of flow of liquid, Application.(Numerical based on above)	06
2: Electricity, Magnetism and Semiconductors	1. State Ohm's Law 2. Calculate the resultant resistance for given combination of resistances. 3. Distinguish between conductors, semiconductors and insulators. 4. Describe the concept of magnetic intensity and flux. 5. Illustrate the IV	2.1 Concept of charge, Coulomb's inverse square law, Electric field, Electric field intensity, potential and potential difference. 2.2 Magnetic field and magnetic field intensity and its units, magnetic lines of force, magnetic flux. 2.3 Electric current, Ohm's law, specific resistance, laws of series and parallel combination of resistance, heating effecting of electric current. 2.4 Conductors, Insulators and Semiconductors, Energy bands, intrinsic	08

	characteristics of PN junction diode.	2.5 and extrinsic semiconductors. p-n junction diode, I-V characteristics of p-n junction, applications of p-n junction diode.	
3: Heat and Fiber Optics	1. List the modes of transmission of heat. 2. Define the terms related to expansion of solid due to heat. 3. State the laws related to gas and specific heat. 4. Solve the numerical related to gas laws and heat. 5. Define the terms related to Optical fiber. 6. Draw the diagram for inner structure of optical fiber. 7. State the applications of Optical fiber. 8. Describe the principle of optical fiber. 9. Solve the numerical based on optical fiber	3.1 Heat: Three modes of transmission of heat. Good and bad conductor of heat with examples, Law of thermal conductivity and S.I.units. (Numerical based on above) 3.2 Boyles law, Charle's law, Gay Lussac's law, absolute zero temperature, General gas equation (statement only), two specific heats of gases, adiabatic index. (Numerical based on above three laws) 3.3 Reflection, Refraction, Snell's law, Optical fiber, Structure of optical fiber. Principle of Optical fiber-total internal reflection. Acceptance angle, Numerical aperture. Applications of Optical Fiber.(Numerical problems)	10
4: Wave Motion and Radioactivity	1. Define different terms related to Acoustics. 2. Reproduce the formula for velocity of sound with end correction. 3. Classify the different types of wave by their characteristics. 4. Recognize sound absorbing textile material. 5. Describe the phenomenon of resonance with examples. 6. Describe the Sabine's formula. 7. Implement the conditions for good acoustics in auditorium. 8. Solve the numerical related to wave motion and acoustics.	4.1 Definition of wave motion, amplitude, period, frequency & wavelength, relation between velocity, frequency & wavelength. Progressive wave, Stationary waves, longitudinal and transverse wave. Node, Antinode. 4.2 Definition of resonance with example. Formula for velocity of sound with end correction. (Numerical based on above) 4.3 Echo, Reverberation, Reverberation Time. Absorption coefficient of material, Sabine's formula, Factors affecting the Reverberation of time and acoustics of building. Sound absorbing materials. 4.4 Radioactivity, α, β and γ rays and their Properties. Radioactive decay law, half-life period, Advantages and disadvantages of Radioactivity.	08

5: Modern Physics (Photoelectricity, LASER, X-Rays)	1. Define the terms related to topics in modern physics. 2. List the properties applications of LASER. 3. State the characteristics of photo electric effect. 4. State the applications related to X-ray, LASER, and photo cell. 5. Implement the photoelectric effect to develop photocell. 6. Illustrate the construction and working of Ruby LASER 7. Describe the production of X-rays. 8. Solve the numerical base on Photo-electricity and X-rays.	5.1 Photon, properties of photons, Planck's hypothesis, Threshold frequency, threshold wavelength and Stopping potential. Work function, Photoelectric effect with characteristics properties. Principle, Construction and working of Photoelectric cell with applications. Einstein's photoelectric equation. (Numerical based on above) 5.2 Properties of laser, Types of laser, absorption, spontaneous and stimulated emission. Definition of Pumping and its type, Population inversion, Metastable state. Applications of LASER in Engineering and biomedical field. 5.3 Introduction to X-rays, Properties of X - rays, production of X-ray using Coolidge tube. Applications of X-rays in Engineering, medical and scientific field.	12
6: Nanotechnology and Non Destructive Testing.	1. Name various NDT methods. 2. State the salient features of the given NDT methods. 3. Classify the given methods into NDT and DT. 4. Clarify the properties of nanoparticles are different than other particles.	6.1 Definition of nanoscale, nanometer, nanoparticle, Application of nanotechnology in Engineering and Technology, medical, cosmetics, environmental, space and defence. 6.2 Non Destructive Testing (NDT), comparison of DT and NDT, Various NDT methods used, Criteria for the selection of NDT method, Merits and Demerits of NDT.	04
		Total Hrs.	48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify the various instruments used in Physics laboratory and follow precautionary measures.	General Properties of Matter	2
2	Measure the outer diameter of a cylindrical body by Vernier Caliper.		2
3	Calculate the diameter of a small spherical body by Outside micrometer screw gauge.		2
4	Calculate the value of Young's modulus of elasticity of given wire and identify the type of material from standard value.		2
5	Find rise of liquid in capillary tube and compute surface tension of liquid.		2
6	Determine the coefficient of viscosity of given fluids by Stoke's method		2
7	Calculate mechanical equivalent of heat, J by electrical method.	Electricity, Magnetism and Semiconductor	2
8	Use magnetic compass to draw the magnetic lines of forces of bar magnet		2
9	Calculate the resultant resistance of given resistances in series and parallel combination.		4
10	Analyze the effect of volume on pressure at constant temperature.	Heat, Gas Laws and Fibre Optics	2
11	Determine inner diameter of resonance tube using Vernier Caliper.	Wave Motion and Radioactivity	2
12	Find the velocity of sound with the help of resonance tube.		4
13	Find total internal reflection of light by pin method.	Modern Physics	2
14	Calculate the surface area (SA), volume (V) and SA/V of an object and measure dimensions required for it.	Nanotechnology and Non Destructive Testing	2
		Total hours	32

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	General Properties of Matter	02(02)	06(03)	00(00)	08(05)
02	Electricity, Magnetism and Semiconductor	05(00)	06(06)	00(00)	11(06)
03	Heat, Gas Laws and Fiber Optics	05(00)	06(00)	00(06)	11(06)
04	Wave Motion and Radioactivity	02(02)	03(06)	06(00)	11(08)
05	Modern Physics	02(02)	06(06)	06(00)	14(08)
06	Nanotechnology and Non Destructive Testing	02(03)	03(00)	00(00)	05(03)
	Total	18(9)	30(21)	12(06)	60 (36)

U – Understand

				A – Analyze / Apply
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❖ **QUESTION PAPER PROFILE FOR THEORY PAPER**

L= Level of Question

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	4	R	2	5	R	2										
02	1	U	3	1	U	3	2	R	3	1	U	3	2	U	3				3/5
03	2	U	3	2	U	3	3	R	3	2	U	3	4	U	3				3/5
04	3	U	3	3	U	3	4	U	3	4	U	3	5	U	3				3/5
05	5	U	3	5	U	3	6	U	3	5	U	3	6	R	3				3/5
06	4	A	6	5	A	6	3	A	6										2/3

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram, selection of equipment. writing procedure etc.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs(if any)	10
5	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	-	-	3	-	-	3	-	-	-
2	3	-	-	-	2	-	3	-	-	-
3	3	-	-	-	-	-	3	-	-	-
4	3	-	-	3	-	-	3	-	-	-
5	3	-	-	-	2	-	3	-	-	-
6	3	-	-	3	-	-	3	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Modern physics	B.L.Thereja, S.Chand& Company Ltd 5 th Edition, 2014	13:978-8-12-190163-5
2.	Engineering physics	V.Rajendran, The McGraw Hill Education Pvt. Ltd, 1 st Edition, 2010	13: 978-0-07-107014-0
3.	Conceptual physics	P.G.Hewitt, San Francisco Addison Wesley- 10 th Edition, 2006	13: 9780321909107
4.	Engineering physics	R.K.Gaur And S.L.Gupta, Dhanpatrai Publication New Delhi, 1987	97-8-18-992822-3

❖ **E-REFERENCES:**

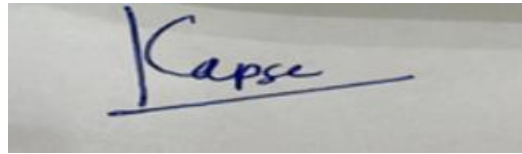
- ❖ <https://www.britannica.com/science/viscosity>, assessed on 21 June 2021.
- ❖ <https://www.livescience.com/58816-photoelectric-effect.html>, assessed on 19 June 2021.
- ❖ <https://www.livescience.com/58816-photoelectric-effect.html>, assessed on 19 June 2021.
- ❖ <https://www2.lbl.gov/abc/wallchart/chapters/03/4.html>, assessed on 19 June 2021.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Vernier Caliper (Least count= 0.01 cm and range= 0 to 12 cm)
2. Screw gauge (Least count= 0.001 cm and range= 0 to 2.5 cm)
3. Young's Modulus- Searle's apparatus with micrometer reading 0.001 cm.
4. Travelling microscope (vertical and horizontal scales with range 0-15 cm with L.C. 0.001 cm)
5. Resonance apparatus with glass tube and metal reservoir (L= 0- 100 cm)
6. Tuning fork -256, 320, 384, 428, 480, 512 Hz.
7. Boyle's apparatus iron base double steel rod, 25 ml fitted with leveling screw on base
8. Stoke's apparatus with glass tube 50 cm.
9. Stop watch GEM 1/10 sec.
10. Ammeter (DC, 0-5 Amp)
11. Millimeter (DC, 0-1 Amp. G.E. type D 50)
12. Voltmeter (DC, 0-3V)
13. Rheostat single tube of 6.5 cm dia., 30 cm length, 5 Amp, 18 ohm, provided with Bakelite solidier with phosphor, bronze contacts.
14. Joule's calorimeter with mass 198 cal/gms.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. S. B. Raut	Lecturer	Government Polytechnic, Nagpur.
2.	Mrs. S.B. Adulkar	Lecturer	Government Polytechnic, Nagpur.
3.	Dr. A.R. Karule	Lecturer	Government Polytechnic, Nagpur.
4.	Dr. N.V. Pradnyakar	Associate Professor	J D College of Engineering and Technology, Nagpur
5.	Dr. V.B.Pawade	Assistant Professor	Laxminarayan Institute of Technology, Nagpur



(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
COURSE CATEGORY	: PROGRAM CORE COURSE
COURSE CODE	: TX101G
COURSE TITLE	: FIBRE OPENING AND CLEANING
TEACHING SCHEME	: TH:03; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT =2 CLOCK HRs.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs(Internal)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Cotton accounts for almost 50% of the worldwide consumption of textile fibers. To convert cotton fiber into yarn, knowledge of fiber characteristics, ginning, baling, opening and cleaning is essential to produce high quality yarns. This course imparts necessary knowledge of selection and working of cleaning and blending machinery for different grades of fibers and anticipated wastes.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to—

1. Classify textile fibres on the basis of their origin.
2. Draw flow chart of spinning process.
3. Identify characters of feeding devices used in blowroom.
4. Justify adjustments of grid bars affecting cleaning efficiency.
5. Describe the controlling device for chute feed system.
6. Calculate production and efficiency of blowroom machine

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Textile raw materials(Natural/synthetic), Ginning, pressing and baling	1a. Classify textile fibres on the basis of their origin. 1b. Describe the given ginning machine. 1c. Justify the importance of given pressing or baling operation.	1.1 Classify textile fibres, generic names of man-made fibres, physical properties of fibres essential for spinning. important cotton varieties and areas of cotton cultivation. Cotton picking – hand and machine picking. 1.2 Cotton ginning: Object of ginning. Single roller gin, double roller gin, saw gins and faults produced in ginning. Modern developments in ginning machinery. 1.3 Cotton pressing and baling, bale dimension density. Standardisation of bales according to norm.	08
2. Yarn classification and process flow chart of spinning mill	2a. Classify given types of yarns. 2b. Draw flow chart of given spinning process. 2c. Draw the input and output product of given yarn manufacturing process.	2.1 Classification of yarns.(single yarn , double yarn properties) 2.2 Flow chart for conversion of cotton fibres to yarn.(Carded/ Combed) 2.3 Object, input, and output of each stage of yarn manufacturing process.	06
3.Blowroom Opening and mixing	3a. State the necessity for conditioning of given bale material before opening. 3b. Identify characters of given feeding devices used in blow room. 3c. Compare mixing with blending on given parameters. 3d.Describe the working of given bale openers mixing machine.	3.1 Object of Blow room, Conditioning of raw materials. 3.2 Opening: Types of opening, degree of opening, intensity of opening, Feeding devices for opening machineries and modern developments in opening devices and opening operations. Factors influencing opening and quality of fibres. 3.3 Blending/Mixing: Purpose and types of blending and mixing 3.4. Machine zones: a. Machines in opening zone: Conventional bale openers and hopper feeders, Automatic bale opening machines. b. Mixing/blending machines:	10

		Manual mixing, Modern mixer(Automixer, multimixer and aero mixer) c. Modern developments in mixing and blending	
4. Cleaning and Blowroom	4a. Justify the given adjustments of grid bars affecting cleaning efficiency of material. 4b. Classify the given type of cleaners.	4.1 Cleaning: Mechanical cleaning, Grid and mote knives. Elements of grid, adjustments of grid bars, Interaction of feed assembly, opening element and grid, air flow cleaning, Cleaning efficiency and resistance to cleaning, factors influencing cleaning. 4.2. Machine zones: a. Coarse cleaners: Mono cylinder cleaner. b. Fine cleaning: Modern fine cleaners. c. Intensive cleaning: Modern intensive cleaners. d. Modern de-dusting machines and Separation of foreign fibre and metals.	10
5. Material regulation and transportation	5a. Justify the need of given transport system in blowroom line.. 5b. Describe the working of given lap forming machine. 5c. Describe Control of material flow by given mechanism. 5d. Illustrate the given waste disposal system. 5e. Describe the controlling devices for chute feed system.	5.1 Transport of material: Need of Transportation. Conveyor belts, lattice and spiked lattices, Pneumatic transport- Basic Principle, separation of air and material. 5.2 Types of scutcher, working of scutcher. 5.3 Control of material flow: Stop-go operation- swing doors, optical sensors. Continuous operation –Automatic lap controlling devices, electronically by Feed commander. 5.4 Waste disposal and waste management 5.5 Chute feed system- types of chute feed system and controlling devices for chute feed system	08
6. Blow room lines and production calculations	6a. Select sequence of blow room machines for given blowroom lines. 6b. Calculate the blow room production and cleaning efficiency from the given data.	6.1 Sequence of modern blow room lines for 100% Polyester, 67:33 P/V. 6.2 Calculations related to Blows per Inch, production, efficiency of Opening and cleaning machine, and Blowroom efficiency.	06
Total Hrs			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	To prepare the classification chart of textile fibers and record the different types of fibers based on their origin.	Textile raw materials (Natural/synthetic), Ginning, pressing and baling	2
2.	To study the cotton picking process and prepare chart showing characteristics of cotton varieties with commercial names used in various mixings.	Textile raw materials (Natural/synthetic), Ginning, pressing and baling	2
3.	Draw and describe the passage of material through different types of ginning machines.	Textile raw materials (Natural/synthetic), Ginning, pressing and baling	2
4.	To study the objects and input/outputs of each department in yarn manufacturing process and record the temperature and RH of each department.	Yarn classification and process flow chart of spinning mill	4
5.	Describe the sequence of operations in the Blow room and draw the different types of feeding devices and opening devices.	Blowroom Opening and mixing	4
6.	Draw and describe the elements of grid and settings of grid.		2
7.	Draw and describe the operation of material through automatic bale opening machines.		2
8.	Draw and describe the different types of mixing machines in blow room.	Cleaning and Blowroom	2
9.	Draw and describe the operation of material through modern cleaning machines.		2
10.	Describe the modern material regulating system in blowroom.	Material regulation and transportation.	2
11.	Draw the passage of material through Scutcher. And record the parameters of blow room lap. Identify the different types of Lap faults and suggest remedial actions.		4
12.	Calculate the Blows per inch, Production and cleaning efficiency of blow room.	Blow room lines and production calculations	4
Total Hrs			32

- The above experiments are based on industrial visit/ videos of ginning and blow room operations.

❖ SPECIFICATION TABLE FOR THEORY PAPER:

R – Remember

U – Understand

A – Analyze / Apply

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Textile raw materials (Natural/synthetic), Ginning, pressing and baling.	02(02)	06(03)	03(00)	11(05)
02	Yarn classification and process flow chart of spinning mill.	02(02)	03(03)	03(00)	08(05)
03	Blowroom Opening and mixing	02(02)	09(03)	00(03)	11(08)
04	Cleaning and Blowroom.	02(00)	06(06)	03(03)	11(09)
05	Material regulation and transportation.	02(00)	03(03)	06(00)	11(03)
06	Blow room lines and production calculations.	02(00)	00(00)	06(06)	08(06)
	Total	12(06)	27(18)	21 (12)	60 (36)

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	1	U	3	2	U	3	1	U	3	2	U	3				3/5
03	3	U	3	3	U	3	3	U	3	3	U	3	3	A	3				3/5
04	4	U	3	4	U	3	4	A	3	4	U	3	4	U	3				3/5
05	5	U	3	1	A	3	2	A	3	5	U	3	4	A	3				3/5
06	5	A	6	6	A	6	6	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6.
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Practical Answer Sheets	1,2,3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Procedure	05
2	Process analysis	10
3	Calculation, Result	05
4	Viva voce	05
	TOTAL	25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	3	3	3	3	3	3	3	--
CO2	3	--	--	--	--	--	3	3	--
CO3	3	--	3	--	--	--	3	3	--
CO4	3	--	3	--	--	--	3	3	2
CO5	3	3	--	3	--	--	3	3	2
CO6	3	3	--	--	--	--	3	3	--

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Introduction to Textile Fibres	H V S Murthy , The Textile Association, India	--
2	Technology of Short Staple Spinning- Vol. I	W. Klein, The Textile Institute Manchester, 1986	0 900739 91 6
3	The Practical Guide To Opening and Carding- Vol. 2.	W. Klein, The Textile Institute Manchester, 1986	0-900739 92 4
4	Elements of Raw Cotton and Blowroom	Prof A K. Khare , Sai Book Centre,	-

5	Textile Yarns, Technology, Structure and Applications	B C Goswami, J G Martindale, F L Scardino, Mahajan Book Distributors, Ed 1977	81-85401-04-07
6	Spun Yarn Technology	Eric Oxtoby, Butterworth and Co. Ltd, London, 1987	0-408-01464-4

❖ **E-REFERENCES:**

1. <http://www.rieter.com/cz/rikipedia/articles/technology-ofshort-staple-spinning/opening/general-considerations-regarding-opening-and-cleaning/> accessed on 29 July 2021
2. <http://www.truetzschler-spinning.com/en/products/blow-room/technical-highlights-blow-room/> accessed on 29 July 2021
3. <http://www.indiantextilejournal.com/articles/FAdetails.asp?id=2010> accessed on 29 July 2021
4. <https://nptel.ac.in/courses/116/102/116102048> accessed on 29 July 2021
5. <https://ordnur.com/spinning/ginning-process-of-cotton> accessed on 29 July 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Textile Laboratory –Blow room machine set up, conventional and modern machines,
Ginning machines.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	Head of Textile Department, Government Polytechnic, Nagpur	Chairman
2.	Dr. Ganesh Kakad	Head of Textile Department, JDET	Academic Expert
3.	Mr. R. N. Yadav	Ex President, Mohota Mills and Textile consultant	Industry Expert
4.	Mr. S.S. Lawand	Lecturer in Textile Manufactures (G.P. Solhapur)	MSBTE Nominee
5.	Dr. S. G. Gaikwad	Lecturer in Textile Manufactures	Member Internal
6.	Mrs. L. S. Chakraborty	Lecturer in Textile Manufactures	Member Internal
7.	Mr. M.N. Gawande	Lecturer in Electrical Engineering	CDC Incharge and Member Secretary
8.	Sanjivani Lonare	Visiting Faculty, Textile Department	Couse Expert

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
COURSE CATEGORY	: PROGRAM CORE COURSE
COURSE CODE	: TX102G
COURSE TITLE	: YARN PREPARATION FOR WEAVING
TEACHING SCHEME	: TH:03; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs(Internal)
PT. EXAM	: 01 HR

❖ RATIONALE:

Fabric manufacturing preparatory process includes converting the yarn into warp beams and good quality weft packages. Removal of objectionable faults in the yarn with uniform build of packages is essential for efficient weaving preparatory. Therefore, process parameters and detailed knowledge of operations and maintenance of these machines are imparted in this course.

❖ COURSE OUTCOMES:

After completing this course students will be able to—

1. Identify equivalent yarn count by using various Yarn Numbering system
2. Demonstrate the winding machine to produce cone/cheese/pirns.
3. Use warping machine to produce warpers beam and weavers beam.
4. Evaluate the process parameters of winding and warping.
5. Apply the drawing-in process for warp tying-in method.
6. Calculate production, efficiency of Winding and Warping machines.

❖ COURSEDETAILS:

A. THEORY:

Units	Specific Learning Outcomes(Cognitive Domain)	Topics and subtopics	Hrs.
1. Yarn Numbering Systems	1a. Compare Direct and indirect Yarn numbering system. 1b. Define various Yarn numbering systems. 1c. Calculate count, resultant count and average count of given yarn. 1d. Identify equivalent count in another system.	1.1 Definition of linear density of yarn(Count), Indirect and Direct Yarn numbering systems. 1.2 Definition, formulae and calculations (a) English Cotton Count, (b) Metric Count, (c) French count (d) Woolen count (e) Worsted count (f) Tex (g) Denier (h) Linen count 1.3 Conversion of linear density from one system to another system. 1.4 Calculations of resultant count of ply yarns and average count.	08
2. Warp Yarn Winding Process	2a. Describe Supply and end packages in Winding. 2b. Classify defects in yarn 2c. Calculate speed and production of Winding machine 2d. Select yarn tensioners and clearers 2e. Describe splicing technique. 2f. State the need of waxing device in winding. 2g. State the causes and remedies of different package faults. 2h. State any three important features of modern winding machine. 2i. Calculate the production per shift in kgs from the given data. 2j. State the object of yarn conditioning.	2.1 Flow chart for the weaving and weaving preparatory process 2.2 Objects of Winding process, supply and end packages of winding. 2.3 Basic principle of package winding parameters- Traverse length, traverse ratio, Winding speed, wind angle, clearing efficiency, knot factor. 2.4 Types of winding machines. Drum winding machine and Precision winding machine: 2.5 Yarn tensioning-Objects and Types of different tensioners. Merits and demerits of yarn tensioners. 2.6 Yarn clearing: objectsand working of electronic yarn clearer (capacitance and photoelectric). 2.7 Knotting and splicing: Types of knots- weavers and fisherman's knot, drawbacks of knots. Splicing technique 2.8 Yarn waxing: objects of waxing, waxing device. 2.9 Study of package faults produced during winding process and their remedies. 2.10 Features of Modern Winding machines. 2.11 Calculations of speed and Production of winding machine. 2.12 Objects of Yarn conditioning	14

3. Weft Yarn Winding	3a Describe construction and working of Pirn Winding machines] 3b Distinguish non-automatic and automatic Pirn Winding machine. 3c Identify package defects in pirn winding. 3d State formula for the production of Pirn winding machines.	3.1 Objects of Pirn Winding Working principle of pirn winding machine. 3.2 Comparison of automatic pirn and non automatic pirn. 3.3 Concept of rewound weft Built of pirn: defects and remedies 3.4 Calculation of pirn winding speed, production & efficiency.	04
4. Direct Warping	4a Define objects of Warping 4b Describe various parts and functions of warping machine 4c Justify the significance of warping process on Beam quality. 4d State any four important features of modern beam warping machine. 4e Calculate production of Direct warping	4.1 Direct Warping (Beam Warping):- (a) Objects (b) Passage of warp, (c) Construction and working of Drum and Spindle driven warping machines, (d) Different types of creels used, their merits and demerits, (e) Different types of tension devices 4.2 Head Stock (a) Spindle and drum drive, (b) Brakes, © Expanding comb, (d) Manual and automatic doffing, (e) Stop motions on Warping machine, 4.3 Significance of warping process on Beam quality. 4.4 Features of Modern Beam Warping machines 4.5 Calculations of production and efficiency of Direct Warping Machine.	10
5. Indirect Warping	5a Describe procedure of leasing and beaming 5b Compare Beam and Sectional Warping 5c State any four features of modern indirect warping machine. 5d Calculate the production of Indirect warping machine	5.1 Indirect Warping:- (Sectional Warping) (a) objects, (b) Passage of warp through machine, (c) Preparation of sections, (d) Construction of warping drum, (e) Lease rod, (f) Section reed, (g) Traverse motion, (h) Section warping, (i) Leasing, (j) Beaming and creeling for colour patterns, (k) Ball warping process	08

		5.2 Features of Modern Indirect Warping machines 5.3 Calculations of production and efficiency of Indirect Beam warping machine.	
6. Drawing-in Process	6a Describe Drawing-in Process 6b Compare Manual and Automatic reaching-in Machines 6d Select automatic reaching-in machine for drawing-in	6.1 Objects of drawing in process. 6.2 Working of Manual, Semi-automatic reaching-in machine, 6.3 Working of Fully automatic warp drawing-in machine	04
Total			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Conversion from direct to indirect and vice-versa of Yarn Count.	Yarn Numbering Systems	04
2	To find out the Resultant Count of the Yarn	Yarn Numbering Systems	02
3	Draw passage of warp through warp winding m/c, speed and process parameter.	Warp Yarn Winding Process	02
4	Draw passage of warp through auto cone winding m/c, and write the process parameters	Warp Yarn Winding Process	02
5	Draw and describe the functions of different types of clearer, splicers and tensioners on winding machines.	Warp Yarn Winding Process	04
6	Identify different defective packages to identify problems in a given machine & take corrective remedial action.	Warp Yarn Winding Process	02
7	Draw passage of yarn through Pirn winding machine and calculate production and efficiency.	Weft Yarn Winding	02
8	Draw the passage of yarn through beam warping m/c, calculate its production and efficiency.	Direct Warping	02
9	To study various types of creels in warping machine.	Direct Warping	04
10	Draw the passage of yarn through sectional warping machine; calculate the production and efficiency of machine.	Indirect Warping	04
11	Identify different types of beam faults and suggest remedial actions	Direct and Indirect warping	02
12	Draw the passage of yarn through Drawing-in m/c.	Drawing-in Process	02
Total Hrs			32

SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Yarn Numbering Systems	02(02)	06(00)	03(03)	11(05)
2	Warp Yarn Winding Process	02(02)	09(06)	06(03)	17(11)
3	Weft Yarn Winding	02(00)	03(03)	00(00)	05(03)
4	Direct Warping	02(02)	03(06)	06(00)	11(08)
5	Indirect Warping	02(00)	06(00)	03(06)	11(06)
6	Drawing-in Process	02(00)	03(03)	00(00)	05(03)
	Total	12(06)	30(18)	18(12)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T-Unit/Topic Number L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	4	R	2										
02	1	U	3	1	U	3	2	U	3	2	U	3	2	U	3				3/5
03	2	U	3	2	U	3	3	U	3	3	U	3	4	U	3				3/5
04	4	U	3	5	U	3	5	U	3	4	U	3	6	U	3				3/5
05	1	A	3	5	A	3	6	U	3	1	A	3	2	A	3				3/5
06	2	A	6	4	A	6	5	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max.Marks
1	Diagram/Description	05
2	Process analysis	10
3	Calculation, Result	05
4	Viva voce	05
	TOTAL	25

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	3	--	--	--	--	3	3	--
CO2	3	--	3	3	--	--	3	3	2
CO3	3	--	3	3	--	--	3	3	2
CO4	3	3	--	3	--	--	3	3	--
CO5	3	--	--	3	--	--	3	3	--
CO6	3	3	--	--	--	--	3	3	--

1:Slight(Low)2:Moderate(Medium)3:Substantial(High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Modern Preparation and Weaving Machinery	A. Ormerod, Wood head Publishing Ltd. Cambridge, England	1 85573 998 4.
2	Conversion of Yarn to Fabric	P. R. Lord, M. H. Mohamed, Wood head Publishing, Ltd. Cambridge, England	9781845692902
3	Weaving Preparation Technology	Gokarneshan N, Abishek Publications, 2009.	9789350434642
4	Fiber to Fabric	Bernard P Cobman, MaGraw-Hill Book Company	0070662363, 9780070662360

❖ **E-REFERENCES:**

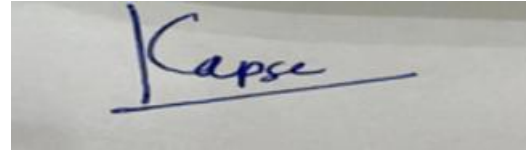
1. http://vasantkothari.com/content/view_presentation/414/06-Yarn-Numbering-System, assessed on 29th July 2021
2. <https://fddocuments.in/document/fundamentals-of-yarn-winding-2013.html> assessed on 29th July 2021
3. https://www.gpp7.org.in/wp-content/uploads/sites/22/2020/04/file_5e98709044bfc , assessed on 29th July 2021
4. <https://www.slideshare.net/Amitsirohi2/textile-warp> , assessed on 29th July 2021
5. <https://www.textileadvisor.com/2019/10/drawing-in-process-weaving-process.html>, assessed on 29th July 2021
6. <https://nptel.ac.in/courses/116/102/116102005>, assessed on 29th July 2021.

❖ **LIST OF MAJOR EQUIPMENTS/ INSTRUMENTS WITH SPECIFICATION**

1. Lea wrap reel
2. Electronic precision weighing machine upto 10mg.
3. Drum winding machine
4. High speed cone winding machine
5. Pirn winding machine
6. Beam warping machine
7. Sectional warping machine
8. Drawing in machine.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	Head of Textile Department, Government Polytechnic, Nagpur	Chairman
2.	Dr. Ganesh Kakad	Head of Textile Department, JDET	Academic Expert
3.	Mr. R. N. Yadav	Ex-President, Mohota Mills and Textile consultant	Industry Expert
4.	Mr. S.S. Lawand	Lecturer in Textile Technology (G.P. Solhapur)	MSBTE Nominee
5.	Dr. S. G. Gaikwad	Lecturer in Textile Technology	Member Internal
6.	Mrs. L. S. Chakraborty	Lecturer in Textile Technology	Member Internal
7.	Mr M.N. Gawande	Lecturer in Electrical Engineering	CDC In charge and Member Secretary
8.	Anuprita Tayde	Visiting Faculty, Textile Department	Course Expert



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

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COURSE CURRICULUM

PROGRAMME : **DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/PK/MT/TX/TR/MC/AI**

COURSE CATEGORY: **AUDIT COURSE**

COURSE CODE : **EV151G**

COURSE TITLE : **ENVIRONMENTAL SCIENCE**

PREREQUISITE : **NIL**

TEACHING SCHEME: **TH: 02; TU: 00; PR: 00 (CLOCK HRs.)**

TOTAL CREDITS : **02 (2 TH CREDIT = 2 CLOCK HR.)**

TH. TEE : **NIL**

PR. TEE : **NIL**

PT. : **NIL**

❖ **RATIONALE:**

The world today is facing the biggest challenge of survival. Degradation of ecosystem, depletion of natural resources, increasing levels of pollution, poses major threat to the survival of mankind. The need of the hour, therefore, is to concentrate on the area of environmental science, which shall provide an insight into various environment related issues.

Environmental science is an interdisciplinary academic field that integrates physical and biological sciences, with the study of the environment. It provides an integrated, quantitative, and interdisciplinary approach to the study of environmental systems & gives an insight into solutions of Environmental problems.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Define the terms related to Environmental Studies.
2. Identify natural resources and problems associated with them.
3. Identify alternate energy resources and use them efficiently during their engineering practices.
4. State measures, to control various types of pollution, which will cause less harm to environment
5. Describe key issues about environment and create public awareness about those environmental issues.
6. Follow environmental ethics as lifelong learning.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. EARTH SYSTEMS AND RESOURCES	1. Name the historical events of earthquakes, volcanoes, Tsunami, cyclone & landslides in the world. 2. Identify problems associated with soil, water 3. Define weather and climate. 4. Describe the global water problems.	1.1 Earth Science: Concepts of Geologic time scale; earthquakes, volcanoes , Tsunami , cyclone & landslides 1.2 The Atmosphere: Weather and climate; the Coriolis Effect 1.3 Global Water Resources and Use: Present scenario, surface and groundwater issues; global problems; and its conservation. 1.4 Soil : soil erosion and other soil problems; methods of soil conservation	04
2.CONCEPT OF BIODIVERSITY	1. Define Biodiversity 2. List Levels of biodiversity 3. Define and list the biodiversity hotspots 4. List the endangered species 5. Prepare a report on value of Biodiversity 6. Suggest methods /steps for Biodiversity conservation	2.1 Definition of Biodiversity 2.2 Levels of biodiversity 2.3 Value of biodiversity 2.4 Threats to biodiversity, loss of biodiversity (biodiversity hotspots) 2.5 Conservation of biodiversity (modern methods of biodiversity conservation)	04
3. ENERGY RESOURCES & CONSUMPTION	1. List various forms of energy 2. Identify projects according to various energy forms 3. State advantages and disadvantages of various forms of energy 4. Select appropriate solutions for Efficient Use of energy 5. Suggest techniques for energy consumption to reduce impact on environment.	3.1 Energy Consumption history 3.2 Present global energy use, Future energy needs 3.3 Energy forms:(conventional and non conventional) 3.4 Energy Conservation 3.5 Renewable Energy: Solar energy; solar electricity; biomass; wind energy; ocean waves and tidal energy; geothermal	06
4. POLLUTION	1. Define pollution and	4.1 Definition of pollution. 4.2 Air pollution: Definition,	08

	pollutants - List the types of pollutants and their sources. - Suggest habits to reduce pollution - State the standard / limiting/ controlling values of various types of pollution.	Classification, sources, effects, Prevention and ambient air quality standards. 4.3 Water Pollution: Definition, Classification, sources effects, Prevention And WHO and BIS water quality standards. 4.4 Soil Pollution/land pollution: Definition, sources, effects, prevention 4.5 Noise Pollution: Definition, sources, effects, prevention. 4.6 Biomedical Waste and E-Waste - Origin, Effects and control Measures. 4.7 CPCB and MPCB norms and roles and responsibilities.	
5 SOCIAL ISSUES & ENVIRONMENT	- Define sustainable development - State sources of Green house effect, acid rains, Global warming - Describe the effect of Nuclear Accidents on environment.	5.1 Concept of development, sustainable development 5.2 Watershed management , rain water harvesting 5.3 Global Warming, greenhouse effect; ozone depletion, relevant laws and treaties 5.4 Nuclear Accidents and Holocaust: Basic concepts and their effect on climate, relevant laws and treaties	05
6. ENVIRONMENTAL EDUCATION	- Differentiate between formal and non formal environmental education - List the various Environmental Protection Act and their provisions - Suggest methods to develop awareness about environment.	6.1 Formal and non-formal education 6.2 Role of Govt. and Non-Govt. Organization 6.3 Indian constitutional provisions regarding the environment. Brief description of the following acts and their provisions: Environmental Protection Act and Prevention of Water, air and noise Pollution Act. 6.4. Concept EIA and environmental Ethics	05
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units
1	Prepare report on Loss of biodiversity, its conservation and also describe biodiversity hotspots.	Concept of Biodiversity
2	Prepare report on use of various renewable energy sources.	Energy Resources and Consumption
3	Collection of articles from news papers, magazines and internet on various types of environmental pollution.	Pollution
4	Prepare report on case study of Industrial /Nuclear / any other Disaster in India.	Social Issues And Environment

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Nil

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Nil

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Class Room Assignments		Assignments	20	08	Assignment Copy	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
				Total	20	08		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	One skill test at end of the End of Every Practical	--	--	Journal	--
		Journal Writing		Assignments	--	--	Journal	--
				TOTAL	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	-	-
2	3	3	-	3	-	-	3	-	-
3	3	3	-	3	-	-	3	-	-
4	3	-	-	3	2	-	3	-	-
5	3	-	-	3	-	-	3	-	-
6	3	-	-	-	2	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Environmental studies	Oxford University Press, New Delhi. 2011	0-19-807228-2
2.	Environmental Science	Y.K. Singh, New Age International, New Delhi	8122418481, 9788122418484
3.	A Text Book of Environmental Science	Arvind Kumar, APH Publishing, New Delhi	817648590X, 9788176485906
4.	Environmental Engineering	A Kamla & D.L.Kanth Rao, Tata Mc Graw-Hill, New Delhi	0-07-451708-2
5.	A Textbook of Environmental Studies	Shashi Chawla, Tata Mc Graw-Hill, New Delhi	9781259006388
6	Environmental studies	Erach Bharucha	UGC , New Delhi

❖ **E-REFERENCES:**

1. https://en.wikipedia.org/wiki/Lists_of_nuclear_disasters_and_radioactive_incidents, accessed on 20 April 2021
2. www.legalserviceindia.com/articles/noip.htm accessed on 20 April 2021
3. <https://prezi.com/8mnz--ldkybc/apex-unit-1-earth-systems-resources/> accessed on 20 April 2021
4. <http://www.conserve-energy-future.com/AlternativeEnergySources.php>, accessed on 20 April 2021

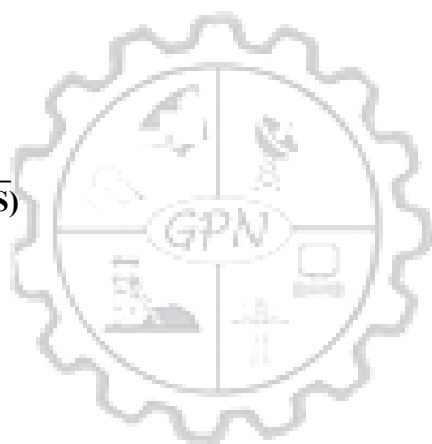
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr N V Raut	Head of Civil Engineering, (I Shift)	Government Polytechnic, Nagpur.
2	Dr S R Kukadapwar	Head of Civil Engineering, (II Shift)	Government Polytechnic, Nagpur.
3	Mr M R Shelote	Consulting Engineer	Shelote Associates ,Onkar Nagar ,Nagpur
4	Dr Mrs R A Wankhade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	Mr A J Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
6	Mr V B Dhait	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)



Kapse

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/AE/PK/MT/TX/MC
COURSE CATEGORY	: ENGINEERING SCIENCE
COURSE CODE	: WS151G
COURSE TITLE	: ENGINEERING WORKSHOP PRACTICE
TEACHING SCHEME	: TH:00; TU: 00;PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE EXAM	: NIL
PR. TEE EXAM	: 02 HRs (Internal)
PT. EXAM	: NIL

❖ RATIONALE:

Workshop Practice is an engineering science course. The knowledge of this course is essential for technician industry to perform his/her duties. Working in workshop develops the attitude of groups working and safety awareness. This course provides industrial environment in the educational institute.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Adapt safety precautions in workshop and observe punctuality.
2. Read and interpret job drawing
3. Use hand tools for various operations
4. Apply basic techniques in manufacturing processes
5. Operate different equipments/machineries used in basic shops
6. Perform jobs according to drawing

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (CognitiveDomain)	Topics and subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Observe the demonstration of hand tools, machine Tools and equipments used in Carpentry Shop. Draw the sketches; write specifications, details, applications and safety rules of above tools.	Carpentry	4
2.	Prepare utility job involving related carpentry operations. (Job to be prepared by group of 2 to 4 students depending on volume of work)		8
3.	Observe the demonstration of hand tools, machine Tools and equipments used in Welding Shop. Draw the sketches; write specifications, details, applications and safety rules of above tools.	Welding	2
4.	Prepare utility job involving related Welding operations. (Job to be prepared by group of 2 to 4 students depending on volume of work)		8
5.	Observe the demonstration of hand tools, machine Tools and equipments used in Fitting Shop. Draw the sketches; write specifications, details, applications and safety rules of above tools.	Fitting	2
6.	Prepare One individual job involving related Fitting operations.		8
7.	Observe the demonstration of hand tools, machine Tools and equipments used in Smithy Shop. Draw the sketches; write specifications, details, applications and safety rules of above tools.	Smithy	2
8.	Prepare One individual job involving related Smithy operations.		8
9.	Observe the demonstration of hand tools, machine Tools and equipments used in Plumbing Shop. Draw the sketches; write specifications, details, applications and safety rules of above tools.	Plumbing	2
10.	Prepare One individual job involving related Plumbing operations.		8
11.	Observe the demonstration of hand tools, machine Tools and equipments used in Sheet Metal Shop. Draw the sketches; write specifications, details, applications and safety rules of above tools.	Sheet Metal	4
12.	Prepare utility job involving related Sheet Metal Shop operations. (Job to be prepared by group of 2 to 4 students depending on volume of work)		8
Total Hrs.			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

NIL

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

NIL

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	-	-	-	-
		Class Room Assignments		Assignments	-	-	-	-
	TEE (Term End Examination)	End Exam	Students	End of the Course	-	-	-	-
				Total	-	-		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practicals	Students	End of Every Practical	20	--	Jobs and Assessment sheet	1, 2, 3,4,5,6
		Journal Writing		Assignment	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25	10	Job and Assessment sheet	1,2,3,4,5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Job Drawing	5
2	Handling Tools, machineries and its operations	5
3	Dimension Accuracy	10
4	Overall finishing of Job	5
Total		25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:****For Mechanical Engineering:**

Course Outcomes (COS)	Program Outcomes (POs)							PSO	PSO
	1	2	3	4	5	6	7	1	2
1	-	-	-	2	2	2	2	2	-
2	3	3	-	2	2	2	2	-	-
3	1	1	-	2	2	1	2	-	-
4	1	1	-	3	2	1	2	-	-
5	3	1	-	3	3	1	2	2	-
6	3	2	-	3	3	2	3	2	-

For Other Programs:

Course Outcomes	Program Outcomes (POs)							PSO	PSO
	1	2	3	4	5	6	7	1	2
1	-	-	-	2	2	2	2	2	-
2	3	3	-	2	2	2	2	-	-
3	1	1	-	2	2	1	2	-	-
4	1	1	-	3	2	1	2	-	-
5	3	1	-	3	3	1	2	2	-
6	3	2	-	3	3	2	3	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	A Course in Workshop Technology	B.S. Raghuwanshi; Dhanpat Rai sons, New Delhi ; 2006, 2011	10-0000017108
2.	Elements of Workshop Technology	Hajra; Choudhary; Media Promoters & Publishers Mumbai, 2009	10-8185099146
3.	A Textbook of Manufacturing Process (Workshop Tech.)	Gupta J.K., R.S. Khurmi S.Chand & Co. New Delhi	81-219-3092-8
4.	Workshop Practice Manual For Engineering Diploma & ITI Students	R K Hegde, Sapna Book House, 2012	13: 9798128005830

❖ E-REFERENCES:

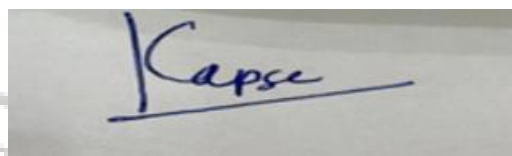
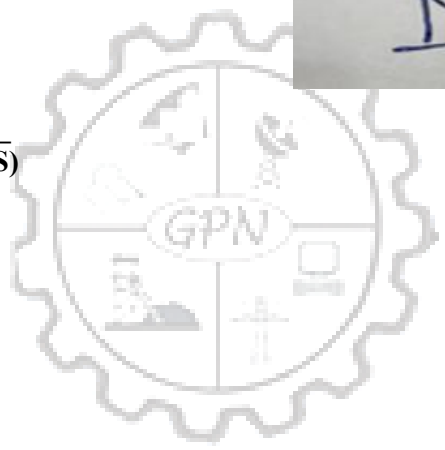
- <http://books.google.co.oin/books/isbn=9380026757> , accessed on 29 May 2021
- <http://www.asnu.com.au/profile./our-process.aspx> , accessed on 29 May 2021
- <https://www.youtube.com/watch?v=swnEQ17cQW> , accessed on 29 May 2021
- <https://www.youtube.com/watch?v=c-FN4M77qyA> , accessed on 29 May 2021

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

1. Welding Transformer (Air Cooled) Single Phase
2. Welding Transformer (Oil Cooled) Three Phase
3. Gas Welding Set
4. Bench Drilling Machine
5. Hydraulic Power Saw Machine
6. Bench Grinder
7. Bench Vice
8. Wood Turning Lathe Machine
9. Circular Saw Machine
10. Portable Wood Cutting Machine
11. Portable Drilling Machine
12. Carpentry Vice
13. Pipe Bending Machine
14. Pipe Vice
15. Pipe Cutter
16. Black smith Hearth
17. Anvil
18. Swage Block
19. Sheet Bending Machine
20. Sheet Cutting Machine
21. Brazing Equipment
22. All Hand Tools and Measuring Tools use in Carpentry Shop, Fitting Shop, Welding Shop, Plumbing Shop, Smithy Shop and Sheet Metal Shop,

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Shri A. W. Wankhade	Workshop Superintendent	Government Polytechnic, Nagpur.
2.	Shri K. S. Thekedar	Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.
3.	Er. A.M.Onkar	Chief Executive Officer	Onkar Furnitures, MIDC, Nagpur
4.	Shri. G.F.Potbhare	Principal	NIT, Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN EE/CM/IT/EC/MT/TX/AI
COURSE CATEGORY	: ENGINEERING SCIENCE COURSE
COURSE CODE	: ME151G
COURSE TITLE	: ENGINEERING GRAPHICS
TEACHING SCHEME	: TH:00; TU: 00;PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE EXAM	: NIL
PR. TEE EXAM	: 02 HR(Internal)
PT. EXAM	: NIL

❖ **RATIONALE:**

Engineering graphics is a non-verbal and graphical language to communicate ideas, instructions and facts with each other clearly and without ambiguity while carrying out engineering jobs on the sites, shop floor etc. It describes the fundamentals, facts, concepts, principles and techniques of Engineering Graphics. The course illustrates techniques of drawing in an engineering field. It helps to develop the idea of visualizing the actual object or part on the basis of drawings and blue prints. This course is useful in developing drafting and sketching skills of the student. This preliminary course aims at building a foundation for the further course in drawing and other allied courses.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Apply various drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.
2. Select and construct appropriate drawing scales and use drawing instruments.
3. Sketch isometric projections into orthographic projections.
4. Visualize three dimensional objects and draw isometric projections.
5. Draw freehand sketches of a given engineering element.
6. Apply knowledge of projections of points and solve the problems on projection of straight lines.

❖ COURSE DETAILS:

A. PRACTICALS :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	PR Hrs.
1. Principles of drawing	1. Use of instruments for drawing, scales, lines and their applications. 2. Use of IS SP-46. 3. Loci of points from given data.	1.1 Use of different drawing instruments and equipment 1.2 Types of letters and numbers (single stroke vertical and numbers only) 1.3 Conventions of lines, 1.4 Dimensioning technique as per IS: SP -46 1.5 Scales (reduced, enlarged and full size)- Plain scale, diagonal scale.	06
2. Redraw and Loci of Points	1. Learn different geometrical construction methods 2. Drawing locus of point from given data	2.1 Different geometrical construction Methods. 2.2 Redrawing. 2.3 Loci of points	06
3. Engineering curves.	1. Draw conic sections. 2. Draw involute, cycloid and state their applications 3. Draw helix, spiral from given data.	3.1 To draw an ellipse by- Arcs of circles method ii) Concentric circles method 3.2 To draw parabola- i) Rectangle method 3.3 To draw hyperbola by- i) Passing through a given point with reference to given asymptotes 3.4 To draw involutes of circle and polygon of maximum six sides 3.5 To draw cycloid, epi-cycloid and hypo-cycloid	12
4. Orthographic projections.	1. Visualize, interpret and draw orthographic views from given pictorial views. 2. Use of IS SP-46 for dimensioning technique.	4.1 Introduction to orthographic Projection. 4.2 First angle and Third angle method of projections. 4.3 Conversion of simple pictorial views into orthographic views and dimensioning techniques as per IS. SP-46	14

5. Isometric projections	1. Visualize, interpret and draw Isometric views from given orthographic views	5.1 Isometric scales 5.2 Isometric views of simple object(plane surfaces, slanting surfaces, and Rectangular, V, Trapezoidal slots)	14
6.Free hand sketches	1.Prepare proportionate freehand sketches of given machine elements 2.Describe functions and use of machine element.	6.1 Types of threads profile – Vee and square, acme, buttress, seller, BA threads, knuckle threads. Types of screws 6.2 Bolts – square and hexagonal bolts, eye bolt 6.3 Types of nuts : square, hexagonal, wing 6.4 Foundation bolts: Eye foundation bolt, Rag foundation bolt, Lewis foundation bolt 6.5 Single and double Riveted Lap and Butt joints	12
Total Hrs.			64

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Draw types of lines, lettering, numbers and two problem from subtopics 1.5 of Unit 1 (01 Sheet)	1. Principles of drawing	06
2.	Draw two problems each from subtopic 2.2 and 2.3 From Unit 2 (01 Sheet)	2. Redraw and Loci of Points	06
3.	Draw Engineering Curves, one problem from each subtopic of Unit 2. (01 Sheet)	2. EngineeringCurves	12
4.	Draw two problem using first angle method of projection (01 Sheet)	3 Orthographic Projections	14
5.	Draw one problem with plane surfaces & otherwith slot, slanting surfaces (using natural scale and isometric scale) (01 Sheet)	4. Isometric Projections	14
6.	Draw Free Hand Sketches – any ten sketches covering all the topics under Unit 6 (01 Sheet)	5. Free Hand Sketches	12
Total Hrs.			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

NIL

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

NIL

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	-	--	-	-
		Class Room Assignments		Continuous	-	--	-	-
	TEE (Term End Examination)	End Exam	Students	End of the Course	-	-	-	-
				Total	-	-		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Drawing Sheets	1, 2, 3,4,5,6
		Drawing Portfolio		Assignments	05	--	Drawing Portfolio	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	25	10	Drawing Answer sheets	1, 2, 3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Neatness , cleanliness and line work on drawing sheet	05
2	Creation of given drawing with proper dimensioning	10
3	In time submission	05
4	Viva Voice	05
	TOTAL	25

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

For Mechanical Engineering :

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	3	2	-	-	-	2	-	-
2	3	3	3	-	-	-	2	-	-
3	3	3	3	-	-	-	3	-	-
4	3	3	3	-	-	-	3	-	-
5	3	3	3	-	-	-	2	-	-
6	3	3	3	-	-	-	2	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Engineering Drawing Practice for Schools and Colleges IS: SP-46	Bureau of Indian Standards, Reprint in , 2003	8170610192
2.	Engineering Drawing	N.D.Bhatt, Charotar Publishing house 53 rd Edition 2019	9789380358963
3.	Geometrical and Machine Drawing	N.D.Bhatt & V. M Panchal, Charotar Publishing house, 20 th Edition 2014	9789380358895
4	Engineering Drawing	D.A.Jolhe, Tata McGrawHill Edu.2010	978-0-07-064837-1
5.	Engineering Drawing	R. K. Dhawan , Published by S. Chand&co. 2012	9788121914314
6	Engineering Drawing	P. J Shaha, S.Chand&co.2013	8121941822

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=ANEvQyt3PnU> accessed on 30 June 2021
- <https://www.youtube.com/watch?v=-W7tH49dBLw> accessed on 30 June 2021.
- <https://www.youtube.com/watch?v=FXP3tKedM5g> accessed on 30 June 2021.
- <https://www.youtube.com/watch?v=j5nwO-JwVv4&list=PLDN15nk5uLiBpnIOK5r3KXdfFOVzGHJSt> accessed on 30 June 2021.
- [https://www.youtube.com/watch?v=77ufJXvXUk4&list=PLIhUrsYr8yHxVky7bfmbRcdXcHjT_K83&index=2\(Iso\)](https://www.youtube.com/watch?v=77ufJXvXUk4&list=PLIhUrsYr8yHxVky7bfmbRcdXcHjT_K83&index=2(Iso)) accessed on 30 June 2021.
- <https://www.youtube.com/watch?v=Jzr5PTbvkVI&list=PL1xA-ZWMKpOMt3ew5vcn3keBxlqHKtlg> accessed on 30 June 2021.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

- Drawing Board with drawing instruments
- Mini-drafter

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Shri P. V. Rekhade	Head of Mechanical Engineering Department	Government Polytechnic, Nagpur.
2.	Y. K. Gaiki	Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.
3.	S. Dhankute	Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.
4.	K. S. Thekedar	Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.



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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
LEVEL NAME	: PROGRAM CORE COURSE
COURSE CODE	: TX201G
COURSE TITLE	: SLIVER FORMATION
TEACHING SCHEME:	TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HRs.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

This is the most important part of the spinning process, because the quality of the final yarn depends on the quality of the intermediate products from which it is made. Complete cleaning of raw material is achieved at carding machine. Draw frame machine imparts order and evenness to the material in sliver form. Upgrading of raw material requires removal of short fibres which is achieved by combing. The object of this course is to have a thorough understanding of the detailed operations involved in these processes and to know the relationships involved in the interplay of various functions.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Apply principles of carding to individualize and clean the fibres.
2. Maintain the card to achieve its objectives and production rate.
3. Impart order and evenness to the material in sliver form on the draw frame machine.
4. Convert the sliver to sliver lap using pre comb machines
5. Upgrade quality of raw material by using comber machine.
6. Set comber machines to eliminate predetermined quantity of short fibres.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Carding	1a. Illustrate given actions of carding with sketch. 1b. Differentiate between lap and chute feed at card on given parameters.	1.1 (a)Objects of carding (b) passage of material through modern card (c) Carding and stripping/doffing actions. 1.2 Operating zones of card: (a)Feed zone: Concepts of lap feed and chute feed, (b)Licker in zone :Licker in, waste removal, carding plates/comb bars, additional licker in (c) Cylinder zone, pre and post carding stationery flats, under casing (d) Flats, control of flat strips (e) Doffer, fibre transfer efficiency, hook formation and classification (f) Doffing devices (g) Coiling.	10
2. Carding quality, maintenance and calculations	2a. Distinguish between flexible and metallic card clothing on given parameters. 2b. Choose type of auto-leveler required for given type of material. 2c. Select the maintenance schedule for given type of maintenance of card. 2d. Maintain and set the given card for Quality and production. 2e. Calculate cleaning efficiency of card with given data. 2f. Calculate production of card with the given data.	2.1 Card clothing: (a) Classification (b) Flexible clothing (c) Metallic clothing (d) Geometry of wire points (e) Clothing specifications for different materials. 2.2 Auto leveling: Types, measuring devices, principles of short, medium and long term auto leveling. 2.3 Maintenance: Stripping, burnishing and grinding. 2.4 Card settings and its importance. 2.5 Cleaning efficiency, waste losses and nep control at card. 2.6 Draft and production calculations	08
3. Draw frame	3a. Realisation of fibre control in roller drafting. 3b. Achieve uniformity and fibre parallelization of the given sliver. 3c. Describe draw frame machine with given drafting parameters. 3d. Maintain the draw frame to achieve uniformity using various arrangements and attachments of drafting rollers 3e.Steps to control specific quality and defects of	3.1 Draw frame- principles of roller drafting, doubling and evenness. Terms- drafting force, floating fibres, fibre friction field , fibre control and Ideal drafting. 3.2 Construction and working of Draw frame. Creel, drafting arrangements, roller setting, factors affecting draft, elements of drafting arrangements – bottom rollers, top rollers, cots, cot maintenance, top roller loading systems, suction system and auto levelers. 3.3 Drafting systems: 3/3 roller drafting with pressure bar, 4/3 roller drafting, 5/4 roller drafting. 3.4 Web collection, trumpets, coiling	12

	given sliver at drawframe.	system, cans, auto can changing. 3.5 Draft, doubling and production calculations. 3.6 Control of sliver uniformity and defects at draw frames.	
4. Preparation for combing	4a. Identify pre-comber machine parameters to produce quality sliver laps. 4b. Configure the fibre hooks in the pre comb process. 4c. Identify defects produced in pre comb process	4.1 Study of different combinations of machines used for comber lap preparation. Effect of lap preparation on comber performance. 4.2 Concept of fibre hooks presentation at the comber. 4.3 Defective production at these machines and remedies for the same.	06
5. Principles of Combing	5a. Achieve the objects of combing. 5b. Enumerate steps to control noil extraction.	5.1 Objects of combing, sequence of operation of comber, degree of combing. 5.2 Noil extraction in forward and backward feed, yarn quality and noil% at comber, influence of machine components and settings on combing quality.	04
6. Comber operations and calculations	6a. Describe given parts of comber and sequence of their operation. 6b. Draw timing chart of given comber operation 6c. Calculate noil and Production of comber with the given data.	6.1 Detailed description of comber machine, Passage of material through comber, Creel, feeding arrangement, nipper assembly, nipper movement, circular comb, half lap, top comb and its operation, piecing and operation of detaching rollers, web collection, aspirator, brush and waste collection, 6.2 Timing diagram of operation of comber. 6.3 Production, draft and noil% calculations.	08
Total			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Draw passage of material through card and identify various zones of carding machine.	Carding	02
2	Calculate speeds, drafts, machine constants, and production rate from gearing plan of given carding machine. Find gear change places on machine to control sliver hank and production.	Carding quality, maintenance and calculations	02
3	Record the schedules of cleaning and maintenance activities to maintain machine in good mechanical condition.		02
4	Record methods to control waste and nep levels on the machine.		02
5	Record by observing use of auto-leveler on card to control sliver uniformity		02
6	Draw passage of material through Draw frame.	Draw frame	02
7	Draw and identify various zones of Draw frame.		02
8	Determine the speeds, drafts, machine constants, and production rate from the gearing plan of given Draw frame. Find gear change places on machine to control sliver hank and production.		02
9	Record the schedules of cleaning and maintenance activities and prepare detail chart of various activities.		02
10	Draw passage of material through sliver lap machine. Make a chart of machine and process parameters.	Preparation for combing	02
11	Draw passage of material through super lap machine. Make a chart of machine and process parameters.		02
12	Draw passage of material through comber machine.	Principles of Combing	02
13	Set various parts of comber machine with tools/gauges to control the comber performance and noil extraction.		02
14	Identify and draw various parts of comber machine.	Comber operations and calculations	02
15	Demonstrate timing chart of comber.		02
16	Determine speeds of each part from gearing plan of comber and. Identify gear change places of comber machine to control hank and production rate.		02
Total Hrs			32

SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Carding	02(02)	09(00)	00(06)	11(08)
02	Carding quality, maintenance and Calculations	02(02)	03(03)	06(00)	11(05)
03	Draw frame	02(02)	06(03)	06(06)	14(11)
04	Preparation for combing	02(00)	03(03)	03(00)	08(03)
05	Principles of Combing	02(00)	03(03)	00(00)	05(03)
06	Comber operations and calculations	02(00)	03(00)	06(06)	11(06)
	Total	12(06)	27(12)	21(18)	60 (36)

R – Remember U – Understand A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	1	U	3	2	U	3	1	A	3	1	A	3				3/5
03	2	U	3	3	U	3	3	U	3	3	U	3	2	U	3				3/5
04	4	U	3	5	U	3	4	A	3	4	U	3	5	U	3				3/5
05	6	U	3	6	A	3	6	A	3	3	A	3	3	A	3				3/5
06	2	A	6	3	A	6	6	A	6										2/3

T= Unit/Topic Number L= Level of Question M= Marks

R-Remember U-Understand A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4, 5, 6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4, 5, 6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4, 5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Practical Answer Sheets	1, 2, 3,4, 5, 6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4, 5, 6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Sheets	1, 2, 3,4, 5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Procedure	10
2	Process analysis	20
3	Calculation and interpretation of the result	10
4	Viva voce	10
	TOTAL	50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
	1	2	3	4	5	6	7	1	2
1	2	3	-	2	1	1	-	-	2
2	3	3	-	2	1	1	-	-	2
3	3	3	-	2	1	1	-	-	2
4	2	2	3	3	1	-	1	1	2
5	2	2	3	3	1	-	3	2	2
6	2	2	3	3	1	1	1	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Technology of Short Staple Spinning- Vol. I	W. Klein, The Textile Institute Manchester, 1986	0 900739 91 6
2	The Practical Guide To Opening and Carding- Vol. 2.	W. Klein, The Textile Institute Manchester, 1986	0-900739 92 4
3	Spinning Preparation – Vol. 3	W. Klein, The Textile Institute Manchester	13-978-3-9523173-3-4
4	Spun Yarn Technology	Eric Oxtoby, Butterworth an Co. Ltd, London, 1987	0-408-01464-4
5	Textile Yarns, Technology, Structure and Applications	B C Goswami, J G Martindale, F L Scardino, Mahajan Book Distributors, Ahmadabad, Ed 1977	81-85401-04-07

❖ **E-REFERENCES:**

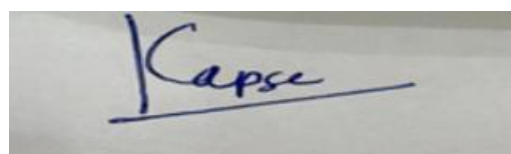
1. <http://www.rieter.com/en/rikipedia/articles/fibre-preparation/the-card/summary/introduction/> accessed on 20th February, 2022
2. http://textilelearner.blogspot.in/2011/04/combing-process-of-cotton-spinning_9182.html accessed on 20th February, 2022
3. <http://nptel.ac.in/courses/116102038> accessed on 20th February, 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Textile Laboratory –Carding, Draw frame, Sliver lap machine, Ribbon lap machine, Super lap machine, Comber machine, Setting tools and gauges.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	Head of Textile Manufactures Department	Government Polytechnic, Nagpur.
2.	Dr.S.G.Gaikwad	Lecturer in Textile Manufactures Department	Government Polytechnic, Nagpur.
3.	Mrs. L. S. Chakraborty	Lecturer in Textile Manufactures Department	Government Polytechnic, Nagpur
4.	Dr. S. B. Muttagi	Ex. Lecturer in Textile Manufactures Department	Government Polytechnic, Nagpur
5.	Mr. R. N. Yadav	Ex-President	Mohota Spg and Wvg Mill, Hinganghat, Wardha
6.	Dr. G. S. Kakad	Head of Textile Engineering Department	JDIET, Yavatmal
7.	Mr. S. S. Lawand	Lecturer in Textile Manufactures Department	Government Polytechnic, Solhapur
8.	Mr.M.N.Gawande	Lecturer in Electrical Engineering Department	Government Polytechnic, Nagpur



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GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
LEVEL NAME	: PROGRAM CORE COURSE
COURSE CODE	: TX202G
COURSE TITLE	: YARN SIZING AND LOOM
TEACHING SCHEME	: TH: 03; TU:00; PR:02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 02 CLOCK HRs.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ RATIONALE:

The knowledge of weaving preparatory processes and power looms machines is very essential. Sizing is the last operation in the weaving preparatory process. To achieve higher productivity and improved fabric quality, it is desired to prepare warp end sufficiently strong enough to withstand the stress & strain during weaving operation. Weaving is one of the methods of woven fabric productions. This course imparts knowledge of basic technology of sizing process and exposed to detailed knowledge of weaving process, power looms and their production calculations.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify sizing ingredients for the given yarn material.
2. Identify different zones of sizing machine and their functions.
3. Select suitable size recipe for different yarn.
4. Illustrate the working mechanism of a plain power loom.
5. Identify different secondary motions of plain power loom.
6. Calculate production, efficiency of plain power loom.

❖ COURSE DETAILS:

A. THEORY:

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Sizing Ingredients and Size paste preparation.	1a. Classify size ingredients. 1b. Describe importance of size preparation process. 1c. Describe with sketch sizing cooking equipment's. 1d. Identify the Precaution taken during size mixing process.	1.1. Objectives of Sizing and Classification of size ingredients & their properties. 1.2. Preparation of size paste. 1.3. Equipment's required: stirrers, cookers and homogenizers. 1.4. Importance of mixing process of sizing ingredients.	06
2. Study of Sizing methods and Sizing machine.	2a. Classify the different sizing techniques. 2b. Draw the warp Passage of sizing machine. 2c. Draw different types of creel and write their functions. 2d. Describe importance of the leasing the warp and wet splitting. 2e. Draw different elements of the size box. 2f. Compare different drying methods in sizing. 2g. Describe head stock in detail. 2h. Draw single end sizing passage. 2i. Select the suitable control device on sizing machine for given yarn material. 2j. Examine faults during sizing process, their causes and remedies.	2.1. Passage of warp yarn through tape or slasher sizing machine. 2.2. Types of creel, their functions, merits and demerits. 2.3. Leasing the warp and concept of wet splitting. 2.4. Elements in sow box and their functions. 2.5. Methods of drying- Two cylinder, Multi cylinder, Hot air, Infra-Red. 2.6. Head stock: Dry splitting, types of comb, measuring and marking motion, winding, beam pressing motion, Drag roller. 2.7. Passage of a Single end sizing. 2.8. Size level control, Temperature control, Moisture control, Stretch control and their importance. 2.9. Migratory ends and lappers during sizing.	10
3. Sizing recipe and Sizing Calculations	3a. Identify the properties of the given size paste. 3b. Plan a correct size recipe for given yarn material. 3c. Identify factors affecting the size pick-up. 3d. Examine the properties of sized yarn. 3e. Describe Developments in sizing machine. 3f. Calculate the parameters related to the sizing.	3.1 Properties of the size paste. 3.2 Size recipes of various yarn. 3.3 Size pick up and Factors affecting it. 3.4 Properties of sized yarn. 3.5 Developments at sizing. 3.6 Calculations – Weight of warp, Size pick up percentage and Size add-on percentage, Production and efficiency of machine.	05
4. Passage of warp through plain power loom and primary motions	4a. Outline weaving process 4b. Classify weaving machines. 4c. Draw passage of warp to cloth through a plain power loom. 4d. Identify the different types of motions on plain power	4.1 Define Weaving process. 4.2 Classification of weaving machines. 4.3 Passage of warp yarns to cloth through a plain power loom. 4.4 Types of motions on plain power loom 4.5 Primary motions of loom. (Objects, Types).	11

	loom. 4e. List various parts of primary motion and unction. 4f. Draw and describe the mechanism for given primary motion on plain power loom. 4g. Draw-loom timing cycle for plain power loo.	A. Shedding motion- Different shedding mechanisms, Types of shed, Negative tappet shedding motion with timing, Early and late shedding, Importance of Dwell period. B. Picking and checking motion -Under pick motion with timing. Picking accessories- Shuttle, pickers, picking strap, check strap, buffers. C. Beat up motion with timing. Importance of eccentricity of sley. 4.6 Method for Indicating loom timing cycle.	
5. Secondary motions of a plain power loom	5a. List the objectives of secondary motion. 5b. Draw and describe seven wheels take up motion. 5c. Describe semi-automatic let off motion. 5d. Compare warp protector motion on the power loom.	5.1. Secondary motion of loom: objects and types. 5.2. Seven wheels take up motion. 5.3. Semi-automatic let off motion 5.4. Objects and type of warp protector motion, Working of Fast reed and loose reed warp protector motion.	08
6. Auxiliary motion and calculations of plain power loom	6a. Describe various parts of Auxiliary motion and their sequence of operation. 6b. Outline the objectives of temple and brake motion. 6c. Examine types of reed, Healds with their merits. 6d. Estimate reed count and heald count. 6e. Calculate Production and efficiency of plain power loom.	6.1 Auxiliary motions – Arrangement of various parts in the shuttle box. 6.2 Object and types of Temples, Brake motion, 6.3 Different types of reed and Healds. 6.4 Calculations - Reed and Heald count, Production and efficiency of the power loom.	08
Total Hrs			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical's	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Observe and outline different types of sizing ingredients and their properties.	Study of Sizing methods and Sizing machine	02
2.	Draw and outline size paste preparation and their equipment's.		02
3	Observe and draw Passage of warp yarn through tape or Slasher sizing machine.		02
4	Observe and draw multi cylinder drying in sizing machine.		02
5	Estimate Size pick up percentage and Size add-on percentage for given recipe.	Sizing recipe and Sizing Calculations	04
6	Calculate Production and efficiency of the sizing machine.		02
7	Observe and Draw passage of warp through plain power loom machine.	Passage of warp through plain power loom and primary motions	04
8	Observe the mechanism and Draw Under pick mechanism on plain power loom.		04
9	Observe the mechanism and Draw seven wheels take mechanism.	Secondary motions of a plain power loom	02
10	Observe the mechanism and Draw warp protector mechanism.		04
11	Observe and Draw shuttle box and temple. Write their functions.	Auxiliary motion and calculations of plain power loom	02
12	Observe the mechanism and Draw brake mechanism of the plain power loom.		02
Total Hrs			32

C. SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Sizing Ingredients and Size paste preparation.	02 (02)	03 (03)	03 (00)	08 (05)
02	Study of Sizing methods and Sizing machine	02 (02)	06 (03)	03 (03)	11 (08)
03	Sizing recipe and Sizing Calculations	02 (00)	03 (00)	03 (03)	08 (03)
04	Passage of warp through plain power loom and primary motions	02 (02)	06 (03)	06 (03)	14 (08)
05	Secondary motions of a plain power loom	02 (00)	00 (06)	06 (00)	08 (06)
06	Auxiliary motion and calculations of plain power loom	02 (00)	06 (00)	03 (06)	11 (06)
	Total	12 (06)	24 (15)	24 (15)	60 (36)

R – Remember U – Understand A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	4	R	2										
02	1	U	3	2	U	3	2	U	3	1	U	3	2	U	3				3/5
03	3	U	3	4	U	3	4	U	3	4	U	3	5	U	3				3/5
04	5	A	3	5	A	3	6	A	3	4	U	3	5	U	3				3/5
05	1	A	3	2	A	3	3	A	3	2	A	3	3	A	3				3/5
06	6	U	6	4	A	6	6	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3, 4, 5, 6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3, 4, 5, 6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Sheets	1, 2, 3, 4, 5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3, 4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Sheets	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Drawing of machine	10
2	Process analysis	20
3	Calculation, Result	10
4	Viva voce	10
	TOTAL	50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	3	-	-	3	3	-
CO2	3	-	-	3	-	-	3	3	-
CO3	3	-	2	3	-	-	3	3	-
CO4	3	-	-	3	-	-	3	3	-
CO5	3	-	2	3	-	-	3	3	-
CO6	3	-	2	3	-	-	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Sizing materials methods machines	D.B. Ajgaonakar, Dr. M.K. Talukdar, V.R. Wadekar Textile Trade Press	-
2	Weaving machine, material & management	Talukdar, Sriramulu & Ajgaonakar Mahajan Publishers Private Limited, Ahmedabad	-
3	Woven Fabric Production – I	NCTUE 2002	-
4	Weaving Mechanism	Marks and Robinson	-
5	Plain loom Motion	K.T. Aswani, Mahajan Publishers Private Limited, Ahmedabad	-

❖ E-REFERENCES:

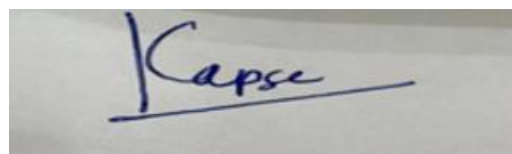
1. www.fiber2fashion.com assessed on 19th January 2022
2. www.nptl.com assessed on 19th January 2022
3. www.wikipedia.org/wiki/weaving assessed on 19th January 2022
4. www.slideshare.net assessed on 19th January 2022
5. www.textilelearner.net assessed on 19th January 2022

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

Textile Laboratory – Sizing machine, power loom and Setting tools and gauges.

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	I/C Head Textile Manufactures	Government Polytechnic, Nagpur.
2.	Mr. S. G. Gaikwad	Sr. Lecturer in Textile Manufactures	Government Polytechnic, Nagpur
3.	Mrs. L. S. Chakraborty	Lecturer in Textile Manufactures	Government Polytechnic, Nagpur.
4.	Mr. R. N. Yadav.	President	Mohota Spg and Wvg Mill, Hinganghat, Wardha
5.	Prof. G. S. Kakad	Head of Textile Department	JDIET, Yavatmal
6.	Prof. S.S.Lawand	Sr.Lecturer in Textile Manufactures	Government Polytechnic, Solhapur
7.	Mrs Shubhangi Bhatkule	Course Expert	Government Polytechnic, Nagpur.



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COURSE CURRICULUM

PROGRAMME	:	DIPLOMA IN TEXTILE MANUFACTURES
LEVEL NAME	:	PROGRAM CORE COURSE
COURSE CODE	:	TX203G
COURSE TITLE	:	PRE TREATMENT AND FINISHING
TEACHING SCHEME	:	TH: 03; TU: 00; PR:02 (CLOCK HRs.)
TOTAL CREDITS	:	04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HRs.)
TH. TEE EXAM	:	03 HRs
PR. TEE EXAM	:	02 HRs (External)
PT. EXAM	:	01 HR

❖ RATIONALE:

Different processing methods like singeing, desizing, scouring, bleaching, mercerizing are pretreatments for dyeing and printing. The value addition of fabric according to end use is done by different finishes. The knowledge and skills related to pretreatments and finishing of textile material is essential for the diploma engineer to create quality textile and solve broad based problems in textile processing industry.

❖ COURSE OUTCOMES:

1. Apply different mechanical preparatory process.
2. Select desizing and scouring process for given fabric.
3. Choose relevant bleaching and mercerization techniques.
4. Select washing and drying machines.
5. Apply the mechanical finishes on given fabric.
6. Choose chemical finishes according to end use.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Mechanical Preparatory process	1a. Construct flow chart of pretreatment for given end product. 1b. Choose shearing and cropping machines for the given fabric. 1c. Describe with sketches the procedure of using singeing machine for given fabric.	1.1 Objective, sequence of textile wet processing, importance of grey fabric inspection and pretreatment for textile processing. 1.2 Shearing and cropping machine features 1.3 Object of singeing machine, Classification of singeing machine, working of hot plate, roller and gas singeing machine with their merits and demerits. Working of yarn singeing machine.	06
2. Desizing and scouring	2a. Select desizing techniques for given cotton fabric. 2b. Evaluate efficiency of desizing of a given fabric. 2c. Identify the changes in the given cotton material due to scouring. 2d. Select relevant scouring method to remove hydrophobic impurities from the given cotton fabric/PET and its blends. 2e. Choose relevant machine for scouring of the given fabric. 2f. Evaluate efficiency of scouring of a given fabric. 2g. Suggest recent developments in desizing and scouring.	2.1 Object of Desizing, classification of desizing methods, enzymatic desizing with merits and demerits, oxidative desizing methods. 2.2 Testing of desized material- 2.3 Objects of Scouring, Scouring agents used and chemical changes during scouring, 2.4 Scouring of cotton and man-made fabrics with necessary precautions. 2.5 Scouring machine- batch wise, semi continuous and continuous process 2.6 Testing of scoured material— Absorbency test, weight loss, residual wax test 2.7 Recent developments in desizing and scouring.	08
3. Bleaching and Mercerisation	3a. Compare bleaching of cotton with different bleaching agents on given parameters. 3b. Choose relevant bleaching process for polyester and its blends. 3c. Apply the relevant method to evaluate efficiency of bleaching on given fabric. 3d. Draw and describe continuous pretreatment process for given fabric. 3e. Demonstrate the effects of mercerization on properties of the given type of fabric. 3f. Select relevant machine for	3.1 Objects of Bleaching, Classification of bleaching agents, bleaching of cotton with Sodium hypochlorite, Sodium chlorite and hydrogen peroxide. 3.2 Bleaching of polyester and its blends. 3.3 Testing of bleached materials- Whiteness index of fabric, Copper number test and methylene blue test. 3.4 Combined desizing, scouring and bleaching process. 3.5 Object of mercerization, effect of mercerization 3.6 Machines: Yarn mercerization, fabric mercerization 3.7 Testing of mercerized materials-	10

	mercerization of given textile with justification. 3g. Analyse the efficiency of Mercerization of given fabric. 3h. Suggest recent developments in bleaching and mercerization.	Lustre, axial ratio, barium activity number 3.8 Recent development in bleaching and mercerization.	
4. Washing and Drying machines	4a. Select relevant washing machine for given textile material. 4b. Select relevant drying machine for given textile material.	4.1 Object of Washing, Classification of washing machines- Rope(slack and tight) , Open width type. 4.2 Object of drying, Mechanism of drying, Classification of drying machines. Drying machines- Float dryer, Cylinder drying, Hot air drying and Stenter	08
5. Mechanical finishes	5a. Classify the finishes for the given fabric. 5b. Apply mechanical finishing treatment to the given fabric.	5.1 Objective of finishing , classification of finishing 5.2 Mechanical finishing treatment- calendaring(7 bowl and schreiner), antishrink finish, and heat setting.	08
6. Chemical finishes	6a. Select the type of softener for given textile material. 6b. Choose chemical finishes according to end use for given textile material. 6c. Suggest recent developments in finishing.	6.1 Softener- Classification, soft finish application. 6.2 Chemical finishing treatment- Backfilling, antcrease finish, wash & wear finish, stiff finish, water repellent, fire retardant and soil release. 6.3 Recent developments in finishing.	08
Total			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Use plate singeing machine for the given cotton fabric.	Mechanical Preparatory Process	02
2	Use desizing method to remove size from the given textile.	Desizing and scouring	02
3	Use open bath scouring method to improve the absorbency of given cotton fabric.		02
4	Use different test method to evaluate absorbency of scoured fabric.		02
5	Use hypochlorite bleaching method to improve whiteness of given cotton fabric.	Bleaching and Mercerization	02
6	Use hydrogen peroxide bleaching method to improve whiteness of the given cotton fabric.		02
7	Use hank mercerization method for the given cotton hank.		02
8	Determine Barium Activity Number(BAN) of the		02

	given mercerized goods.		
9	Use washing machine to wash the given fabric sample.	Washing and Drying machines	02
8	Use drying machine to dry the given fabric sample		02
9	Use calendaring machine to give mechanical finish to given fabric	Mechanical finishes	02
10	Test the given finish on fabric sample as temporary or permanent.		02
11	Formulate recipe of stiff finish on the given fabric	Chemical finishes	02
12	Formulate recipe of soft finish on the given fabric		02
13	Use resin finish / Backfilling finish/ stiff finish to the given fabric sample.		04
Total Hrs			32

C. SPECIFICATION TABLE FOR THEORY PAPER

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Mechanical Preparatory process	02(02)	06(03)	00(00)	08(05)
02	Desizing and scouring	02(02)	06(03)	03(00)	11(05)
03	Bleaching and Mercerisation	02(02)	03(00)	06(06)	11(08)
04	Washing and Drying machines	02(00)	06(06)	03(00)	11(06)
05	Mechanical finishes	02(00)	00(00)	06(06)	08(06)
06	Chemical finishes	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	24(15)	24(15)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	1	U	3	2	U	3	2	U	3	1	U	3				3/5
03	2	U	3	4	U	3	4	U	3	4	U	3	4	U	3				3/5
04	3	U	3	6	U	3	2	A	3	6	U	3	6	A	3				3/5
05	3	A	3	3	A	3	4	A	3	5	A	3	5	A	3				3/5
06	5	A	6	6	A	6	3	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R – Remember

U – Understand

A – Analyze / Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Who m	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	ST	Students	After each practical	20	--	Practical Answer Sheets	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Sheets	1, 2, 3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Performance	20
2	Writing skill	10
3	Testing	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSOs	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	3	-
2	3	2	-	3	2	-	3	3	2
3	3	2	-	3	2	-	3	3	2
4	3	-	-	-	-	-	3	3	-
5	3	3	-	3	2	-	3	3	2
6	3	3	-	3	2	-	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Technology of Textile Processing	V. A. Shenai, Sevak publication, Vol X, 1987	OCLC:313590523
2	Chemical Processing of Textiles	NCUTE publication 2002	
3	An Introduction to Textile finishing	J.T Marsh, Chapman & Hall, 2nd Edition, 1966	978-1114790087
4	Technology of Dyeing	V.A Shenai, Sevak Publications, 1984	
5	An Introduction to Textile finishing	J.T Marsh, Chapman & Hall, 2 nd Edition, 1966	978-1114790087
6	Dyeing and chemical Technology of Textile Fibres	E R Trotman, John Wiley & Sons Inc; 6 Sub edition .1985	978-0471809104
7	Chemical Preparatory process for textiles	G Nallankilli and A.Edwin Sundar NCUTE publication 2003	
7	Chemical Technology in the Pre Treatment Processes of Textiles	S.R. Karmakar, Elsevier Science, 1 edition, 1999	9780444500601

❖ **E-REFERENCES:**

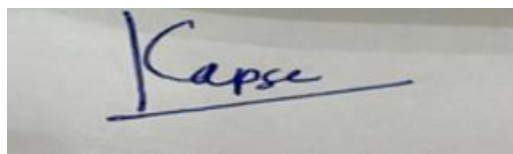
- 1 <https://nptel.ac.in/courses/116/102/116102054/> assessed on 9th feb 2022
- 2 <http://www.textileassociationindia.org/> assessed on 9th feb 2022
- 3 <https://nptel.ac.in/courses/116102016> assessed on 9th feb 2022
- 4 <http://textilelearner.blogspot.in/2012/02/textile-ebooksbooks-free-download-for.html> assessed on 9th feb 2022
<http://nptel.ac.in/> assessed on 9th feb 2022

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

- 1 Beaker dyeing machine
- 2 Weighing balance
- 3 Oven
- 4 Scissors
- 5 Beaker
- 6 Hot plate
- 7 Glass rod
- 8 Thermometer

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Dr. C. P. Kapse	Head of Textile Department	Government Polytechnic, Nagpur.
2	Dr. S.G.Gaikwad	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
3	Mrs. L. S. Chakraborty	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
4	Mr M.V.Gokhale	Lecturer in Chemical Processing	Mahila Nikalas ,Nagpur
5	Prof. S.S.Lawand	Lecturer in Textile Technology	Government Polytechnic, Solhapur
6	Prof. G.S. Kakad	Head of Textile Department	JDIT, Yavatmal
7	Mr. R.N.Yadav	President	RSR Mohota Spinning and Weaving Mill



(Member Secretary PBOS)

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GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
COURSE CATEGORY	: PROGRAM CORE COURSE
COURSE CODE	: TX204G
COURSE TITLE	: FIBRE AND YARN TESTING
TEACHING SCHEME	: TH:03; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HRs.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

The advances in textile manufacturing technology are improving the quality of the textile day by day. To ensure best quality as per the needs of the customer, many advances in textile testing are also taking place simultaneously. It is therefore essential for textile engineers to appreciate the importance of testing and to develop skills to test the textiles as per standards using advance testing methods.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Apply the various sampling techniques and moisture relationship in textiles.
2. Determine the length, fineness, maturity and trash in fibre.
3. Measure the count, twist of given yarn.
4. Measure the tensile properties of fibre and yarn
5. Use evenness testers to check the variations in sliver, roving and yarn.
6. Select modern fibre testing machines and formulate control chart for assessment.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Introduction to Textile Testing and Moisture Relations in Textile	1a. Apply sampling method for given material 1b. Describe test method to identify different types of fibre in given textile material. 1c. Analyze the effect of humidity on given textile material. 1d. Measure the moisture content and regain of given material.	1.1 Objective of Textile Testing, Sampling: Aim of Sampling, Types of Sample(Random Sample, Bias Sample, Numerical Sample), Sampling techniques for fibres – Bulk zoning, Squared and cut squared techniques. Sampling techniques for yarn. 1.2 Fibre Identification - Burning and solubility test for cotton, wool, silk, jute, polyester, viscose, Polypropylene and acrylic. 1.3 Atmospheric conditions and Relative humidity for textile testing and its measurement: wet and dry bulb hygrometer. Effect of humidity on processing of material 1.4 Moisture regain and moisture content relationship, Hysteresis curve, Measurement of moisture content and regain of textile materials (Conditioning Oven and Shirley Moisture Meter) Influence of moisture on fibre properties, Factors affecting regain of textile material	08
2. Fibre Testing	2a. Analyse the length parameters for given fibre sample. 2b. Measure the fibre fineness for given material. 2c. Determine the maturity of given fibre sample. 2d. Identify the trash in given material using trash analyser. 2e. Apply grading system on given cotton fibre.	2.1 Fibre length – Technical significance of fibre length, measurement of fibre length parameters using Baer sorter and digital fibrograph. 2.2 Fiber Fineness Importance and Measurement, Influence of fibre fineness on spinning process, methods of measuring fineness by airflow method. 2.3 Fibre maturity: Technical significance of fibre maturity, Factors affecting fibre maturity, Determination of maturity by caustic soda swelling method and differential dyeing method. 2.4 Trash: Classification of trash and its measurement by Shirley trash analyser. 2.5 Cotton Grading- American, Egyptian and Indian cotton grading	10
3. Yarn Count and Twist Measurement	3a. Measure the count of given yarn. 3b. Determine the twist of given yarn	3.1 Yarn count- Testing of yarn count- Quadrant Balance, Beesley balance, Wrap Reel and weighing balance. Relation between yarn count and diameter. 3.2 Yarn twist, twist direction, twists multiplier/Factor, functions of twist in yarn structure, twist and yarn strength relation, effect of twist in yarn and fabric properties. Measurement of twist in single and double yarns, straightened fibre method, twist contraction method, twist to break test	06

		method and Take up Twister(untwisting principle)	
4. Tensile testing of fibre and yarn	4a. Describe different Tensile Terms 4b. Describe the principle for measuring tensile strength of textile material 4c. Describe the working principle of Fibre Strength tester 4d. Analyze the test results of Yarn Strength tester 4e. Describe the working of UTM	4.1 Tensile Terms: Load, breaking load, Stress, Strain, Elastic recovery, stress strain curve, Initial Modulus, Work of Rupture, yield point, CSP, RKM Value , 4.2 Principle for testing tensile strength: CRE, CRT, CRL, pendulum lever. Strain gauge. Inclined plane. Balancing lever principle, impact principle or ballistic principle. 4.3 Fibre strength Testers: Stelometer, Pressley Strength Tester 4.4 Single yarn Strength Tester, lea strength tester, Instron 4.5 Factors influencing tensile properties of textile materials.	08
5. Evenness Testing	5a. Classify the yarn variation 5b. Identify irregularity of yarn 5c. Analysis of classimat fault. 5d. Test the hairiness of given yarn.	5.1 Classification of yarn variation(Random and Periodic variation), Expression of irregularity($U\%$ and $C.V\%$), Basic irregularity, index of irregularity. Addition of irregularities. 5.2 Measurement of yarn irregularities, visual examination, cutting & weighing method, capacitance principle and photoelectric testers. 5.3 Spectrogram analysis, Measurement of Yarn Imperfections & Classimat faults (Uster Classimat). Effect of irregularity 5.4 Hairiness in spun yarn and its Measurement(Microscopic and photoelectric)	10
6. Advanced fibre and Yarn testing instrument and Quality Control chart	6a. Use advanced fibre testing machine to test the given fibre properties. 6b. Elaborate the features of given advanced yarn testing machine. 6c. Prepare the quality Control charts.	6.1. Principle and working of AFIS instrument, Features of HVI fibre testing machine. Comparison between AFIS and HVI fibre testing machines. 6.2 Features of advanced strength testing- Tensojet and Tensorapid 6.3 Quality control chart and its interpretation from the given data. P Chart, R chart, correlation coefficient.	06
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Calculate Relative humidity of spinning and weaving department from the given data.	Introduction to Textile Testing and Moisture Relations in Textile	2
2	Measure moisture regain in given sample by Shirley moisture meter.		2

3	Identify fibre by Burning test and solubility test.		2
4	Measure the different length parameters of fibre by comb sorter analysis	Fibre Testing	2
5	Measure Fiber fineness using air flow method.		2
6	Measure the trash content in given cotton sample		4
7	Determine twist in single yarn and double yarn.	Yarn Count and Twist Measurement	2
8	Measure count of yarn in yarn form and fabric form.		4
9	Measure the strength of given cotton fibre.	Tensile testing of fibre and yarn	2
10	Measure the strength of single yarn and CSP of a lea.		2
11	Test U% and imperfections in sliver, roving and yarn during mill visit.	Evenness Testing	2
12	Analyze Spectrogram of Uster machine during mill visit		2
13	Perform fibre testing on AFIS /HVI during mill visit.	Modern fibre testing instrument and Quality Control chart	2
14	Perform Yarn testing on Tensojet/ Tensorapid during mill visit		2
Total Hrs			32

C. SPECIFICATION TABLE FOR THEORY PAPER:

R – Remember U – Understand A – Analyze / Apply

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction to Textile Testing and Moisture Relations in Textile	02(02)	06(00)	03(03)	11(05)
02	Fibre Testing	02(02)	06(03)	06(03)	14(08)
03	Yarn Count and Twist Measurement	02(00)	03(00)	03(03)	08(03)
04	Tensile testing of fibre and yarn	02(02)	03(06)	03(00)	08(08)
05	Evenness of Yarn	02(00)	03(03)	06(06)	11(09)
06	Modern fibre testing instrument and Quality Control chart	02(00)	00(03)	06(00)	08(03)
	Total	12(06)	21(15)	27(15)	60(36)

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	4	R	2										
02	1	U	3	1	U	3	1	A	3	2	U	3	1	A	3				3/5
03	2	U	3	2	U	3	3	U	3	3	A	3	2	A	3				3/5
04	4	U	3	4	A	3	3	A	3	4	U	3	4	U	3				3/5
05	6	A	3	6	A	3	5	U	3	5	U	3	6	U	3				3/5
06	2	A	6	5	A	6	5	A	6										2/3

T= Unit/Topic Number L= Level of Question M= Marks

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6.
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Practical Answer Sheets	1,2,3,4,5,6

		Journal Writing		Assignments	05	--	Journal	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Setting of experiments	10
2	Process analysis	20
3	Calculation and interpretation of the result	10
4	Viva voce	10
	TOTAL	50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	3	3	3
CO2	3	-	3	3	-	-	3	3	3
CO3	3	-	3	-	-	-	3	3	3
CO4	3	2	3	3	-	-	3	3	3

CO5	3	-	3	3	-	-	3	3	3
CO6	3	-	-	3	-	-	-	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Textile testing	P. Angappan and R. Gopalakrishnan	0408705159
2	Principle of Testing	J. E. Booth	0408704586
3	Structural Mechanics of fibres, yarns & fabrics	Herle, Grosberg and Backer	9781855739963
4	Grammar of Textile Design	H.Nisbet , Abhishek Publisher, Chandigarh	9788182475144

❖ E-REFERENCES:

- 1 <http://www.textileassociationindia.org/> assessed on 27th January 2022
- 2 <https://www.google.com/search?q=baer+sorter+instrument&oq=baer+sorter&aqs=chrome.1.69i57j0i512l2.6298j0j7&sourceid=chrome&ie=UTF-8> assessed on 27th January 2022
- 3 <https://nptel.ac.in/courses/116/102/116102019/> assessed on 27th January 2022
- 4 <http://www.designdiary.nic.in/> g. <http://textilelearner.blogspot.in>
- 5 Physical Testing of Textiles by B. P. Saville, 1999, Woodhead Publishing Ltd., U. K
- 6 Principles of Textile Testing by J. E. Booth, 1961, Heywood Books, London
- 7 Testing and Quality Management – Edited by V. K. Kothari, IAFL Publications, New Delhi
- 8 Handbook of Textile Testing and Quality Control by E. B. Grover and D. S. Hamb
- 9 Websites of textile testing instrument manufacturers, namely Uster, SDL etc.
- 10 BIS, BS, ASTM and other standard methods of textile testing

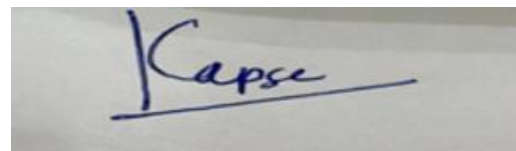
❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

- 1 Hand loom for sample preparation
- 2 Pick counting glass
- 3 Pick glass to find out EPI, PPI, twist direction and type of weaves
- 4 Beesley balance
- 5 Electronic balance
- 6 Counting lens
- 7 Cutting template
- 8 Scissors
- 9 Measuring scales
- 10 Educational videos/animation films on preparation of different fabric structures
- 11 Fabric Analysis sheets
- 12 Fabric samples of different weaves

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	Head of Textile	Government Polytechnic, Nagpur.

		Department	
2.	Dr. S. B. Muttagi	Rt. Lecturer in Textile Technology	Government Polytechnic, Nagpur.
3.	Dr. S. G. Gaikwad	Lecturer in Textile Technology	Government Polytechnic, Nagpur
5.	Mrs. L. S. Chakraborty	Lecturer in Textile Technology	Government Polytechnic, Nagpur.



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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
COURSE CATEGORY	: PROGRAM CORE COURSE
COURSE CODE	: TX205G**
COURSE TITLE	: FIBRE SCIENCE AND TECHNOLOGY
TEACHING SCHEME	: TH:03; TU: 00;PR: 00(CLOCK HRs.)
TOTAL CREDITS	: 03 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HRS.)
TH. TEE EXAM	: 01 HR
PR. TEE EXAM	: NIL
PT. EXAM	: 30 Minutes(MCQ Based Any 25 out of 30)

❖ **RATIONALE:**

Manmade fiber technology is a part of textile engineering where textile fibers are developed from artificial sources. The demand of manmade fibers is on the rise and they are required in the ever growing market for apparel, industrial applications and for functional uses. A global demand for manmade fiber is continuously increasing year by year and innovations continue to generate the new products. This subject provide knowledge regarding manmade fiber technology and various manmade fibers, their physical properties, and manufacturing process which is very essential for yarn spinning, weaving and processing also. The course content should be taught and implemented with the aim to develop require skills and competency in students.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Differentiate between manmade fibre and natural fibre.
2. Explain the manufacturing process of Viscose, Polyester, Nylon 6, Nylon 6.6 fiber and Acrylic fiber
3. Distinguish the process of Melt, Wet and Dry spinning process used in manufacturing process.
4. Explain Spin Finish and Specialty fibres in manmade fibers
5. Describe Tow-to-Top conversion technologies.
6. Explain filament texturing technologies.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Linear Polymer and Raw Material	1a. Differentiate between manmade and natural fiber with fibre forming polymer. 1b. Describe the features of the polymer in the production of manmade fibers. 1c. Draw the structure of fibre polymer and properties of fibers.	1.1 Properties and characteristic of manmade fibre and of synthetic fibre. 1.2 Polymers Criteria for fiber forming polymers. Polymerization process 1.3 Polymer and its structure for properties of fibre.	06
2. Production Process of Important Manmade Fiber	2a. Explain the production process of Polyester, Nylon 6 Nylon 66, Acrylic fibers and rayon fibres. 2b. Sketch the flow chart of the production of viscose rayon fibers.	2.1 Manufacturing process for Polyester Fiber, Nylon 6 and Nylon 66, Acrylic Fiber, Viscose Rayon fibers and Polypropylene fibre. 2.2 Flow diagram of production of Viscose rayon fiber.	12
3. Melt, Wet and Dry spinning	3a. Explain Melt spinning, wet spinning process and Dry spinning. 3b. Distinguish the Melt, Wet and Dry Spinning. 3c. Determine process parameters related to spinning process of manmade fibers. 3d. Describe the high speed spinning and process parameters	3.1 Melt spinning process, wet spinning process and Dry spinning process. Variables and condition for Melt spinning and High speed spinning. 3.2 Single and Double Extruder. Mani fold – spin block section. 3.3 Variables and condition for Melt, dry and wet spinning. 3.4 High speed spinning, Quenching operation. Post spinning operation.	08
4. Spin Finish and Heat setting Specialty in Manmade Fibers	4a. Describe and compare the properties, application and functions of spin finish. 4b. Describe the different method of application of spin finish. 4c. Explain the impact of drawing and heat setting process on properties of synthetic fibre. 4d. Discuss the limitations of synthetic fibres 4e. Describe the salient features of modified polyester fibers,	Spin Finish 4.1 Spin finish: Functions, Desirable properties, Chemical constitute, affecting factors 4.2 Method of application: Dipping roller method, Metered finish system. Problems encountered during the use of Spin Finish. 4.3 Drawing and Heat setting impact on fibre properties of synthetic fibres. Specialty Man Made Fibers (Modified synthetic fibers) 4.4 Limitations of synthetic fibers. 4.5 Modified polyester fibers: Hydrophilic, Hollow, Low pilling, Flame Retardant Silky, Cationic Dye able polyester fiber,	08

	modified nylon fiber, modified acrylic fibre and modified rayon. 4g. Elaborate on given spin draw process.	Modified nylon fiber , modified acrylic and modified rayon. 4.6 Bi-component fiber and Lycra (elastomeric fiber) 4.7 Spin draw processes: H4S process and FDY process. Preparation of Dope (Solution).	
5. Tow-to-Top Conversion	5a. Explain principle of operation of Tow-to-top conversion. 5b. Differentiate the features of various cutting methods.	5.1 Principle of operation and objectives Tow-to-top conversion 5.2 Cutting methods: Crush cutting, Stretch break, Abrasive method.	06
6. Filament yarn texturing	6a. Describe the need of Texturing. 6b. Compare the various textured yarn configuration. 6c. Explain principle of false twist Texturing, Air jet texturing and stuffer box Texturing. 6d. Describe the parameters setting features of the machine.	6.1 Texturing - advantages, classification 6.2 Methods of production by false twist – spindle and friction twisting 6.3 Factors affecting stretch characteristics of false twist textured yarns. 6.4 Draw texturing, Air Jet Texturing, stuffer box texturing.	08
			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Outcomes in Psychomotor Domain)	Units	Hrs. required
		NIL	

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Linear Polymer and Raw Material	02(00)	04(02)	00(00)	06(02)
02	Production Process of Important Manmade Fiber	02(00)	06(02)	06(02)	14(04)
03	Melt, Wet and Dry spinning	02 (00)	02(00)	06(02)	10(02)
04	Spin Finish and Heat setting Specialty in Manmade Fibers	02(00)	04(02)	06(00)	12(02)
05	Tow-to-Top Conversion	02(00)	02(00)	02(00)	06(00)
06	Filament yarn texturing	02 (00)	04(00)	06(00)	12(00)
	Total	12(00)	22(06)	26 (04)	60 (10)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q. 01 to Q. 35	1	R	2	1	U	2	1	U	2	1	U	2	2	R	2	30/35
	2	U	2	2	U	2	2	U	2	2	U	2	2	A	2	
	2	A	2	2	A	2	2	A	2	3	R	2	3	U	2	
	3	A	2	3	A	2	3	A	2	3	A	2	4	R	2	
	4	U	2	4	U	2	4	A	2	4	A	2	4	A	2	
	5	R	2	5	U	2	4	U	2	5	A	2	6	R	2	
	6	U	2	6	U	2	6	A	2	6	A	2	6	A	2	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Who m	Frequenc y	Max Mark s	Min Mark s	Evidence Collected	Course Outcome s
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	--	--	Journal	1, 2, 3,4,5,6
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End Of the Course			Practical Answer Scripts	1,2,3,4,5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End Of The Course	Questionnaires			

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	3	-
2	3	-	-	-	-	-	3	3	-
3	3	-	-	-	-	-	3	3	-
4	3	-	-	-	-	-	3	3	-
5	3	-	-	-	-	-	3	3	-
6	3	-	-	-	-	-	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1	Manufactured Fibre Technology	V. B. Gupta and V. K. Kothari, Chapman & Hall, 1997	
2	Science and Technology of Manmade fibres,	S. P. Mishra, Suraj Publications, 2007.	
3	Fibre chemistry – The Processing of Manmade Fibres,	V. A. Usenko, Springer New York Publications, 2004	
4	Natural Fibres and Man Made Fibres	D. Saravanan, Proceedings of AICTE Staff Development Programme, New Delhi, 2006	
5	Physical properties of textile fibers,	W.E.Morton, J W S Hearle, The Textile Institute Manchester	
6	Synthetic fibres production	A. A. Vaidhya, Universal Book corporation	
8	Introduction to Textile Fibres	H V S Murthy, The Textile Association, India	

❖ **E-REFERENCES:**

1. <https://nptel.ac.in/courses/116102026>, assessed on 18 January 2022
2. <https://www.slideshare.net/sheshir/textile-fibres-copy>, assessed on 18 January 2022
3. <https://nptel.ac.in/courses/116102053>, assessed on 18 January 2022
4. <https://www.fibre2fashion.com/industry-article/2429/chemical-modification-of-polyester>, assessed on 18 January 2022

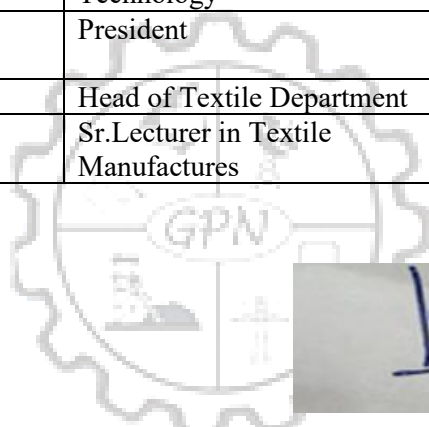
5. <http://www.nitttrc.edu.in/nptel/courses/video/116102053/lec30.pdf>, assessed on 18 January 2022
6. <https://archive.nptel.ac.in/courses/116/102/116102010> assessed on 18 January 2022
7. <https://archive.nptel.ac.in/courses/116/102/116102053> assessed on 18 January 2022

8. LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

NIL

9. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	HOD, Textile Manufactures Department	Government Polytechnic, Nagpur.
2.	Dr S.G.Gaikwad	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
3.	Mrs. L. S. Chakraborty	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
4.	Mr. R. N. Yadav.	President	Mohota Spg and Wvg Mill, Hinganghat, Wardha
5.	Prof. G. S. Kakad	Head of Textile Department	JDIET, Yavatmal
6.	Prof. S.S.Lawand	Sr.Lecturer in Textile Manufactures	Government Polytechnic, Solhapur



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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
LEVEL NAME	: PROGRAM ELECTIVE COURSE
COURSE CODE	: TX206G
COURSE TITLE	: GARMENT TECHNOLOGY
TEACHING SCHEME:	TH: 03; TU: 00; PR:02 (CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT= 2 CLOCK HRs.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ RATIONALE:

This course provides knowledge regarding garment manufacturing technology. With increased production demand, industries have adopted scientific approach for automation in machines and processes. In this course students will be able to develop skills to select fabric, prepare efficient marker planning to minimize waste. They will also be able to set operation sequence and material handling. Essential efforts are made to satisfy industrial needs by this course.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Understand the process of Garment manufacturing Industry.
2. Identify suitable design pattern of the garment with the grading.
3. Recognize the objects of the cutting process after Spreading.
4. Identify different types of seams and stitches.
5. Describe the working process of sewing machine.
6. Understand the different types of trims and components.

❖ **COURSEDETAILS:****A. THEORY:**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1 Introduction to Garment Technology	1a.State the importance of garment manufacturing Industry. 1b. Describe the process flowchart of garment manufacturing.	1.1 Importance of Garment industry. 1.2 Process flow chart of Garment manufacturing.	02
2 Pattern Making, Grading & Marking	2a. State the importance of pattern making for the garment. 2b. Describe the methods of marker planning. 2c. Identify the efficiency of marker plan. 2d. State the principle of garment pattern drafting. 2e. State the rules of garment pattern grading.	2.1 Importance of Garment Pattern making 2.2 Methods of marker planning. 2.3 Efficiency of marker plan 2.4 Principle of Garment Pattern drafting. 2.5 Rules of Garment Pattern grading.	09
3. Spreading and Cutting	3a. Identify the nature of the fabric package. 3b. State the requirement of spreading process. 3c. Differentiate manual and automatic spreading 3d.State the objectives of the cutting process. 3e.Differentiate manual and computerized cutting process. 3f. Explain given cutting device.	3.1 Nature of fabric packages. 3.2 Requirements of Fabric spreading process. 3.3 Methods of spreading. 3.4 Objectives of cutting process. 3.5 Methods of cutting – Manual and computerized. 3.6 Types of cutting devices – Straight knife, Round knife, Band knife, Notcher, Driller and Die-cutting.	09
4. Seams and Stiches	4a. List objects of sewing. 4b. Describe different types of Seams. 4c. Describe different types of Stitches. 4d. State the importance of feed mechanism. 4e. List the specifications of the sewing thread 4f. State the properties of seam performance. 4g. Identify the problems of stitch formation 4h. Identify the cases of sea puckers.	4.1 Objectives of sewing. 4.2 Types of seams 4.3 Types of stitches 4.4 Introduction of feed mechanism. 4.5 Specifications of sewing threads. 4.6 Properties of seam performance. 4.7 Problems of stitch formation 4.8 Causes of seam Puckers.	12

5. Sewing machine	5a. Identify the different types of the sewing machine. 5b. State the functions of sewing machine. 5c. List the parts of the sewing machine. 5d. Write a note on Button hole machine. 5e. Draw Eight head theory. 5f. Identify the tools required for making pattern.	5.1 Types of sewing machine. 5.2 Functions of sewing machine needles. 5.3 Parts of sewing machine 5.4 Introduction of Button hole machine. 5.5 Introduction of Eight head theory. 5.6 Tools of pattern making.	06
6. Study of Trims and components	6a. List different types of components. 6b. State the advantages of fusing process. 6c. Describe purpose of the pressing. 6d. List different category of the pressing. 6e. Enlist the different pressing equipment's. 6f. Explain any garment accessories. 6g. Apply CAD/CAM in garment manufacturing	6.1 Types of components. 6.2 Introduction and advantages of fusing. 6.3 Purpose of pressing. 6.4 Categories of pressing. 6.5 Pressing equipment and methods. 6.6 Garment accessories- Labels, Linings, inter linings, lace, shoulder pads, eyelets and zip fasteners, buttons and rivets Application of CAD/CAM in Garment Manufacturing.	10
Total			48

B. LIST OF PRACTICALS /LABORATORY EXPERIENCES/ ASSIGNMENTS:

Practical's	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Draw pattern making for Baby wear.	Pattern Making, Grading & Marking	2
2.	Draw pattern making for Men's wear Shirt.		4
3.	Draw pattern making for Women's wear kurta.		2
4.	Draw pattern making of trouser.	Spreading and Cutting	2
5.	Cutting and stitching Baby garment.		2
6.	Cutting and stitching Men's Shirt.		4
7.	Cutting and stitching Women's Kurta.		2
8.	Cutting and stitching of trouser.		4
9.	To prepare the classification chart of seams.	Seams and stitches	2
10.	To prepare the classification chart of stitches.		2
11.	To prepare the chart of sewing machine and record the different types of needles.	Sewing machine.	2

12.	To study application of CAD / CAM software for garment manufacturing.	Study of Trims and components	4
		TOTAL HRS.	32

SPECIFICATION TABLE FOR THEORY PAPER

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction to Garment Technology	02(00)	00(03)	03(00)	05(03)
02	Pattern Making, Grading & Marking	02(02)	03(00)	06(03)	11(05)
03	Spreading and Cutting	02(02)	03(00)	06(03)	11(05)
04	Seams and Stiches	02(00)	03(03)	06(06)	11(09)
05	Sewing machine	02(02)	03(03)	06(00)	11(05)
06	Study of trims and components	02(00)	03(03)	06(06)	11(09)
	Total	12(06)	15(12)	33(18)	60(36)

R–Remember

U– Understand

A–Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	2	R	2	3	R	2	5	R	2										
02	1	A	3	2	U	3	2	A	3	1	U	3	2	A	3				3/5
03	3	U	3	4	U	3	4	A	3	2	A	3	3	A	3				3/5
04	4	U	3	4	A	3	5	U	3	5	A	3	5	A	3				3/5
05	5	U	3	6	U	3	6	U	3	6	A	3	6	A	3				3/5
06	3	A	6	4	A	6	6	A	6										2/3

T=Unit/TopicNumber

L= LevelofQuestion

M=Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6.
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuo us Assessment of Practical	Students	End of Every Practical	20	--	Practical Answer Sheets	1,2,3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Procedure	10
2	Process analysis	20
3	Calculation, Result	10
4	Viva voce	10
	TOTAL	50

❖ MAPPINGCOURSEOUTCOMESWITHPROGRAMOUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	3	-	3	3	3
CO2	-	-	3	3	-	-	3	3	3
CO3	3	-	3	-	-	2	3	3	3
CO4	3	3	3	3	3	3	3	3	3
CO5	-	-	3	2	3	3	3	3	3
CO6	3	-	-	3	-	-	-	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXTBOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Handbook of Garment Manufacturing Technology	Eiri Board, Engineers India ResearchInstt,2003	8189765027
2	Garment Manufacturing: Processes, Practices and Technology	Prasanta Sarkar, Online ClothingStudy,2015	9789383701759
3	Garment Manufacturing Technology	D Nayak and R Padhye,WoodheadPublishing,2015	978-1-78242-232-7
4	The Technology of Clothing Manufacture	Harold Carrand Barbara Latham, Blackwell Science Ltd. Second Edition,1994	6-632-03748-2

❖ **E-REFERENCES:**

1. <https://garmentsmerchandising.com/different-methods-of-marker-making/> assessed on 16 feb 22
2. <https://www.onlineclothingstudy.com/2013/05/what-is-marker-marker-making-marker.html>, assessed on 16 feb 22
3. <https://garmentsmerchandising.com/key-purposes-of-fabric-spreading/> assessed on 16 feb 22
4. <http://textilemerchandising.com/fabric-spreading-process-in-garments/> assessed on 16 feb 22
5. <https://www.onlineclothingstudy.com/2020/11/understanding-spreading-modes-for.html>, assessed on 16 feb 22
6. <https://garmentsmerchandising.com/types-of-fabric-lay-used-in-spreading/>, assessed on 16 feb 22
7. <https://garmentsmerchandising.com/advantage-and-disadvantage-of-semi-automatic-spreading/>, assessed on 16 feb 22
8. <https://garmentsmerchandising.com/list-of-fabric-package-used-in-apparel-industry/>, assessed on 16 feb 22
9. <https://www.textileflowchart.com/2014/12/flow-chart-of-garment-manufacturing-technology.html>, assessed on 16 feb 22
10. <https://www.textileschool.com/193/garment-production-process/>, assessed on 16 feb 22
11. <http://www.nitma.org/>, assessed on 16 feb 22
12. <http://textilelearner.blogspot.in>, assessed on 16 feb 22
13. <http://www.fibre2fashion.com/industry-article/free-apparel-industry-article/4>, assessed on 16 feb 22

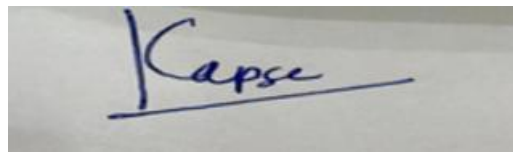
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

Swing Machine
 Scissor
 Measurement Tap
 Chalk
 Marker paper
 Fabric Sample

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	Head of Textile Department	Government Polytechnic, Nagpur.
2.	Dr.S.G.Gaikwad	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
3.	Mrs. L. S. Chakraborty	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
4.	Shubhangi Bhatkule	Visiting Faculty, Textile Department	Couse Expert
5.	Prof.S.S.Lawnd	Lecturer in Textile Technology	Government Polytechnic, Solhapur
6.	Dr. G.S. Kakad	Head of Textile Department	JDIT,Yavatmal

7..	Mr. R.N.Yadav	President	RSR Mohota Spinning and Weaving Mill
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A photograph of a handwritten signature in blue ink on a white background. The signature appears to be 'Kapse' with a long horizontal line extending to the right.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
LEVELNAME	: PROGRAM ELECTIVE COURSE
COURSECODE	: TX207G
COURSE TITLE	: APPAREL MERCHANDISING
TEACHING SCHEME:	TH: 03; TU: 00; PR: 02 (CLOCK HRS.)
TOTALCREDITS	: 03(1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCKHR.)
TH.TEEEXAM	: 03HRs
PR.TEEEXAM	:02 HRs(External)
PT.EXAM	: 01HR

❖ RATIONALE:

Merchandising is a specialized management function within the fashion industry. It is the business that moves the world fashion from designers showroom to retail sales floor and in to the hands of consumers. It is the internal planning that takes place within a retail organization in order to ensure adequate amount of merchandise are on hand to be sold at prices that the consumers are willing to pay for a profitable operation.

❖ COURSEOUTCOMES:

After completing this course students will be able to–

1. Evaluate fashion clothing categories, Styling & Size range.
2. Identify organizational structures of garments Industry.
3. Determine the role of quality control in apparel merchandising.
4. Illustrate the process of market research.
5. Examine swatches collection and procedure.
6. Analyses process of brand development.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Organization of Apparel business	1a. Explain the Language of fashion 1b. Conclude the adoption theories of Fashion. 1c. Evaluate fashion clothing categories, Styling & Size range	1.1 Introduction to fashion concept; Definitions and meaning, Classification, Style, Change, Acceptance, Taste, Look, Trends, Season; Color, Texture, Fit, Comfort, Brand or Designer Label, Fashion cycles. 1.2 Trickle down, Trickle up, Trickle-across and Laver's law1. 1.3 Women's wear, Men's wear Children's wear	06
2.Overview of Apparel Industry & Apparel Production	2.a Evaluate apparel industry 2.b Identify organizational structures of garments Industry. 2.c Conclude apparel construction techniques 2.d Discuss machinery &equipment used in Garment industry. 2.e Electoral production methodology in garment Industry. 2.f Develop design & Tech-pack for garments industry	2.1 Major segments of apparel industry 2.2 Structure of Export house, Buying house and Domestic companies, Buyer's classification and buying network in exports. Sources of fabric buying and selling of finished fabric. 2.3 Introduction to Drafting & Patten making. 2.4 Cutting, sewing, finishing, washing, stain removal, embellishment. 2.5 Assembly line, individual garment manufacturing, job work quality checkpoints. 2.6 Introduction & Definition. Labeling& Packing.	08
3.Basics of Apparel Merchandising	3a. Identify to apparel Merchandising. 3b. Determine the role of quality control in apparel Merchandising.	3.1 Functions and role of merchandising process. 3.2 Meaning and need for quality control in merchandising process.	10
4.Assessment of Market Trends	4a. Examine Garment market and process of market Research. 4b. Illustrate the process of market research.	4.1 Conduct research on target market, materials, trims, better or new sources / suppliers for procurement 4.2 Review previous designs & samples developed by the business to assess relevance to current design/samples	10

5. Vendor Identification	5a. Describe vendor management 5b. Examine swatches collection and procedure. 5c. Recommend appropriateness of Tech-pack	5.1 Method of Identify the vendors for initial development and confirmation on bulk if approved, Method of update the Vendor database. 5.2 Collect all kind of relevant swatches to meet the design brief from fabrics to trims and get confirmation on the same. 5.3 Method of appropriate personnel are consulted with to confirm.	06
6. Quality management Systems and Brand development	6a. Justify the need for quality management system. 6b. Describe consumer behavior. 6c. Analyses process of brand development.	6.1 Quality Policy, Data records, and traceability documenting the Quality System. 6.2 Quality manual, Quality audit, ISO 9000 registration. 6.3 Quality licensing and Quality mark brand.	08
Total			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Prepare a chart of market planning.	Organization of Apparel business	02
2	Calculate market efficiency.		04
3	Demonstrate pattern making with CAD.	Basics of Apparel Merchandising	02
4	Prepare Pattern Grading.		04
5	Demonstrate waste reduction by efficient marker planning.	Assessment of Market Trends	04
6	Test the fabric properties like- GSM, Thickness, stiffness, crease recovery, tear strength of fabric.	Overview of Apparel Industry & Apparel Production	02
7	Check the fabric grain, straight, cross and bias before cutting the fabric.		02
8	Illustrate fabric cutting , seam allowances and notches.	Vendor Identification	02
9	Prepare Merchandise calendar with time of P.O and delivery of goods.		02
10	Prepare Merchandising document.	Quality management Systems and Brand development	02
11	Prepare export documents.		04
12	Prepare inspection reports for the apparels.		02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Organization of Apparel business	02(02)	03(03)	03(00)	08(05)
02	Overview of Apparel Industry & Apparel Production	02(00)	06(03)	03(03)	11(06)
03	Basics of Apparel Merchandising	04(00)	03(03)	06(03)	13(06)
04	Assessment of Market Trends	02(02)	06(00)	06(06)	14(06)
05	Vendor Identification	00(02)	06(03)	00 (00)	06(05)
06	Quality management system and Brand development	02(00)	00(03)	06(03)	08(06)
	Total	12(06)	24(15)	24 (15)	60 (36)

R– Remember U–Understand A – Analyze /Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	3	R	2	6	R	2	4	R	2	6/9
	1	R	2	4	R	2	5	R	2										
02	1	U	3	2	U	3	2	U	3	1	U	3	2	U	3				3/5
03	3	U	3	4	U	3	4	U	3	3	U	3	2	A	3				3/5
04	5	U	3	5	U	3	2	A	3	6	U	3	5	U	3				3/5
05	3	A	3	3	A	3	1	A	3	3	A	3	6	A	3				3/5
06	6	A	6	4	A	6	4	A	6										2/3

T= Unit/Topic Number L= Level of Question M= Marks

R-Remember U-Understand

A-Analyze/Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

What	To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
		Total	100	40		
Direct Assessment Practical	Students	After every Practical	20	--	Practical Answer Sheets	1, 2, 3,4,5,6
		Assignments	05	--	Journal	1, 2, 3,4,5,6
		TOTAL	25	10		
	Students	End Of the Course	50	20	Practical Answer Sheets	1, 2, 3,4,5,6
Indirect Assessment	Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
		End Of The Course	Questionnaires			

❖ **ASSESSMENT AND EVALUATION SCHEME:**

S.No	Description	Max Marks
1	Drawing of passage	10
2	Description of Process	20
3	Calculation, Result	10
4	Viva-Voce	10
5	Total	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	
	1	2	3	4	5	6	7	1	2
1	3						3	3	
2	3		3	3			3	3	
3	3		3	3			3	3	3
4	3						3	3	
5	3		3	3			3	3	
6	3	3	3	3			3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXTBOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Apparel Merchandising: The Line Starts Here Hardcover – 2006	Jeremy A. Rosenau, David L. Wilson, Fairchild Books, 2 nd Revised Edition, 2006	10:1563674483
2	Visual Merchandising and Display	Martin M Pegler, Fairchild Publications, 6 th Edition, 2011	10: 1609010841 13: 978-1609010843
3	The Business of Fashion: Designing, Manufacturing, and Marketing	Leslie Davis Burns, Nancy OBryant, Fairchild Publications, 2002	9781563671821
4	Apparel: Concepts and Practical Applications	Beverly Kemp-Gatterson, Barbara L Stewart, Fairchild Publications, 1 st Edition, 2008	9781563674815

❖ **E-REFERENCES:**

- <http://textilelearner.blogspot.in/2013/10/role-of-merchandiser-in-apparel-industry.html>
- <http://www.slideshare.net/muhundhanmurugasen/merch-24728178>
- <http://engg1ali.blogspot.in/2013/09/process-flow-chart-of-merchandising-and.html>
- <http://www.onlineclothingstudy.com/2015/05/apparel-merchandising-notes.html>
- http://www.powershow.com/view/174f2-YzdhN/Apparel_Merchandising_powerpoint_ppt_presentation

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Stitching machine
2. Inspection table
3. CAD software
4. Cutters
5. Notchers

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
4.	Dr. C. P. Kapse	Head of Textile Department	Government Polytechnic, Nagpur.

(Member Secretary PBOS)



(Chairman PBOS)



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GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/ME/CE/EE/PK/MT/TX/IT/CM/ MC/AI/EC/TR
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE201G
COURSE TITLE	: INDUSTRY 4.0**
TEACHING SCHEME	: TH:02; TU: 00; PR: 00 (CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HR (Objective Type Online Examination)
PR. TEE EXAM	: ---
PT. EXAM	: 20 Min (Objective Type)

❖ RATIONALE:

The course is designed for students to cover the concepts of Industry 4.0 is a novel paradigm for industrial production in which digitization plays a fundamental role. The world is at the onset of the Industrial Revolution and this revolution is very much driven by the smarts in automating decision making and processes. Advancements in IT has resulted in immense improvements in computational power across nearly all electronic devices and enhanced capabilities in connecting the dots in an increasingly networked society. This course provides a comprehensive coverage on, among others, the role of data, manufacturing systems, various Industry 4.0 technologies, applications and case studies.

❖ COURSE OUTCOMES:

At the end of the course students will be able to :

1. Identify the phases for implementing core idea of Industry 4.0
2. Select Proposed Framework for Industry 4.0. based on IoT
3. Apply Proposed Framework for Technology Roadmap used in Harnessing and sharing knowledge in organizations.
4. Select cases studies of Industry 4.0 and Identify the opportunities, challenges brought about by Industry 4.0

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Introduction to Industry 4.0	1a. Select various Industrial Revolution in the context of Industry 4.0. 1b. Identify the change India is prepared for Industry 4.0 on the given data 1c. Identify Need and challenges of Industry 4.0 on the basis of given points. 1d. Compare Industry 4.0 factory with present factory on the basis of given points. 1e. Identify how Predictive analysis helps many industries to manage resources based on the given data.	1.1 The Various Industrial Revolutions, Core idea of Industry 4.0 • What is Industry 4.0? • Technologies that Drive Industry 4.0 • Challenges for Industry 4.0 1.2 How is India preparing for Industry 4.0 Digitalization and the Networked Economy 1.3 Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0 1.4 Comparison of Industry 4.0 Factory and Present Factory, • Quality 4.0 • Supply Chain 4.0 1.5 Predictive Analytics for Smart Business Transformation • Maintenance 4.0 • Maturity Models for Industry 4.0	08
2. Road to Industry 4.0	2a. Identify the concept of Smart Devices, Products, Smart Logistics and Smart Cities on the given points. 2b. Analyze the concept for Proposed Framework for Industry 4.0 on the basis of given points. 2c. Differentiate technologies of Industry 4.0 and their global forerunners on the basis of given points.	2.1 Smart Manufacturing, Smart Devices and Products, Smart Logistics and Smart Cities • Industrial Control Systems and IIoT • Automation & Software Technologies 2.2 Proposed Framework for Industry 4.0. Four components of Industry 4.0 • Instrumented • Interconnected • Inclusive • Intelligent 2.3 Technologies for enabling Industry 4.0 • IoT • Big data/Industrial Analytics • Cloud Manufacturing • Robotics	06

		• Artificial Intelligence (AI) • Additive Manufacturing	
3. Technology Roadmap for Industry 4.0 And Role of Data, Information , Knowledge and Collaboratio n in Future Organizatio ns	3a. Identify framework for Technology Roadmap for Industry 4.0 on the basis of given points. 3b. Differentiate Collaborative robots and Universal Robots w.r.t components. 3c. Select the Support System for Industry 4.0 from the given points. 3d. Analyze the concept of Harnessing and sharing knowledge in organizations on the given data.	3.1 Proposed Framework for Technology Roadmap, Strategy Phase • Internal IT roadmap • DevOps roadmap • Infrastructure roadmap • Architecture Roadmap • Software Roadmap • Internal Systems Roadmap • Hardware Procurement Roadmap 3.2 Robotic Automation and Collaborative Robots, Recent Technological Components of Robots (5 important components) • Manipulators • End Effectors • Feedback Devices • Controllers • Locomotive Devices 3.3 Decision Support System for Industry 4.0, Resource-based view of a firm:- Using Microsoft Power BI to implement a decision support system - a Business Intelligence solution data as a new resource for organizations, Harnessing and sharing knowledge in organizations	10
4. Business Issues in Industry 4.0, Case Studies and Augmented Reality in The Age of Industry 4.0	4a. Identify key Opportunities and Challenges in business Industry 4.0 on the given points. 4b. Identify the Skill Key areas for workers in the Industry 4.0 on the basis of given data. 4c. Identify strategies for manufacturing companies to transition to Industry from the given data. 4d. Select the Case studies based on IIoT from the given data. 4e. Identify the Industrial Applications of AR	4.1 Opportunities and Challenges Opportunities • Real-time data • Advanced maintenance and monitoring possibilities • Real-time monitoring, IoT-enabled quality improvement and cobots (collaborative robots) • Superior sustainability and better working conditions • Earn the trust and loyalty the modern consumer with personalization opportunities Challenges • A Gap in Technical Skills • Data Sensitivity • Interoperability • Security • Handling Data Growth	08

	based on the given technology. 4f. Identify the limitation of Industry 4.0 on the basis of given points.	4.2 Future of Works and Skills for Workers in the Industry 4.0 Era 4.3 Strategies for competing in an Industry 4.0 world Types of Competitive Strategy • Cost Leadership • Product differentiation • Customer Relationship Management (CRM) • Cost Focus • Commitment to Customers Strategy 4.4 IIoT case studies • Carnival Corp's Ocean Medallion • Schering & Hasse's Quality Manufacturing • Samsung and Hipaax's TaskWatch Solution • Caterpillar's Asset Intelligence Platform • Bosch's Nexeed Track and Trace 4.5 AR Hardware and Software Technology, Industrial Applications of AR 4.6 Limitations of Industry 4.0	
		Total	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Industry 4.0	01(00)	02(00)	02(00)	05(00)
2	Road to Industry 4.0	01(00)	02(00)	03(01)	06(01)
3	Technology Roadmap for Industry 4.0 and Role of data, information, knowledge and collaboration in future organizations	02(00)	02(01)	05(01)	09(02)
4	Business issues in Industry 4.0, Case Studies and Augmented Reality in the Age of Industry 4.0	02(00)	03(01)	05(01)	10(02)
	Total	06(00)	09(02)	15(03)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M-Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	A	1	1	U	1	1	U	1	4	A	1	30/35
	2	R	1	2	U	1	2	U	1	2	A	1	2	A	1	
	2	A	1	2	A	1	3	R	1	3	R	1	3	U	1	
	3	U	1	3	U	1	3	A	1	4	R	1	4	R	1	
	4	U	1	4	U	1	4	U	1	4	U	1	4	A	1	
	4	A	1	4	A	1	4	A	1	4	A	1	1	A	1	
	3	A	1	3	A	1	3	A	1	3	A	1	3	A	1	

❖ ASSESSMENT AND EVALUATION SCHEME:

Direct Assessment		Theory		Practical		Indirect Assessment	
What	To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes	
CA (Continuous Assessment)	Students	PT	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments	Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	Students	End Exam	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
TEE (Term End Examination)			Total	50	20		
CA (Continuous Assessment)	Students	Continuous Assessment of Practical	End of Every Practical	--	--	Journal	
		Journal Writing	Assign-ments	--	--	Journal	
	Students	End Exam	End of the Course	--	--	Practical Answer Scripts	
TEE (Term End Examination)			Total	--	--		
Student Feedback on course		After First PT	Student Feedback Form				

❖ SCHEME OF PRACTICAL EVALUATION:

Nil

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	
	1	2	3	4	5	6	7	1	2	3
1	3	3	-	-	-	-	3	-	-	-
2	3	-	-	-	-	-	3	-	-	-
3	3	-	-	-	-	-	3	-	-	-
4	3	3	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N .	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Managing Transformation- Objectives to Outcomes	J.Satyanarayana, Prentice Hall, India	13:9788120345379
2	The State, IT and Development.	Kenneth Kenniston, R K Bagga and Rohit Raj Mathur Sage Publications India Pvt. Ltd.	9780761933991
3	e-Government – The Science of the Possible	J.Satyanarayana, Prentice Hall, India	13:9780134195728

❖ E-REFERENCES:

- <http://www.csi-sigegov.org/publications.php> accessed on 22/07/2022
- <https://negd.gov.in> accessed on 03/08/2022
- <https://www.nisg.org/case-studies-on-e-governance-in-india> accessed on 04/08/2022

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:

1. Computer System with Latest Configuration
2. Internet connectivity
3. Applications developed for accessing different e-governance projects.

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr.M.A.Rahman	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mr.A.A.Uike	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mr.P.S.Thakre	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr. Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/ME/CE/EE/PK/MT/TX/IT/CM/MC/ AI/EC/TR
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE203G
COURSE TITLE	: INTRODUCTION TO E-GOVERNANCE**
TEACHING SCHEME	: TH:02; TU: 00; PR: 00 (CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HR (Objective Type Online Examination)
PR. TEE EXAM	: ---
PT. EXAM	: 20 Min (Objective Type)

❖ RATIONALE:

The course is designed for students to cover the concepts of e-Governance and to understand how technologies and business models shape the contours of government for improving citizen services and bringing in transparency.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify the concepts, terminology and technology of e-government.
2. Develop environment for promoting Digital System Infrastructure and National Data Warehouses.
3. Apply the knowledge of Cyber Laws and security.
4. Use Architecture and models of e-governance for innovation and change management.
5. Identify Challenges and Approach of E-government Security.
6. Analyze using available tools the given case studies of e-governance.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to E-Governance	1a. Identify Need of E-Governance from the given points. 1b. Identify the factors for global trends of growth in E-Governance from the given points. 1c. Analyze the model of Digital Governance from the given data. 1d. Select the Maturity Models of E-Governance from the given points.	1.1 Needs of E-Governance, Issues in E-Governance applications and the Digital Divide; Evolution of E-Governance, its scope and content 1.2 Present global trends of growth in E-Governance and related issues. 1.3 Models of E-Governance: Introduction; Model of Digital Governance: Broadcasting/ Wilder Dissemination Model, Critical Flow Model, Comparative Analysis Model, Mobilization and Lobbying Model, Interactive-service Model/Government-to-Citizen-to-Government Model (G2C2G) 1.4 Evolution in E-Governance and Maturity Models: Five Maturity Levels, Characteristics of Maturity Levels, Difference between E-governance and E-government	06
2. E-Governance Infrastructure and Strategies	2a. Differentiate between Digital system and Traditional system on the basis of given points. 2b. Choose the concepts of National Data Warehouses with Data Warehousing and Data Mining from the given points.	2.1 E-readiness, Digital System Infrastructure, Legal Infrastructure, Preparedness, Institutional Infrastructure, Preparedness, Human Infrastructure, Preparedness, Technological Infrastructure, Preparedness System Calls-Concept, types of system calls. 2.2 Introduction to National Data Warehouses: Census Data, Prices of Essential Commodities; Other areas for Data Warehousing and Data Mining..	05
3. Cyber Security in E-Governance	3a. Select threats and Assessing damages in cyber security based on given characteristics. 3b. Identify the need of Security in Mobile	3.1 Cyber Security: Information System Threats and attacks, Classification of Threats and Assessing Damages . 3.2 E-Government key Security Challenges (Network Security, Identification, Access Control,	05

	and Wireless computing based on given data. 3c. Analyze the security framework for given organization on the given points. 3d. Identify the need of security metrics on the basis of given points.	Usability), 3.3 Security Implication key Organizations, Laptops Security Framework for Information Security. 3.4 Security Metrics Information Security Vs Privacy, Basic Principles of Information Security, Confidentiality, integrity Availability in Information Security, information Classification and their Roles	
4. Architecture and Models of e-governance	4a. Select the PPP Architecture of e-governance Model from the given points. 4b. Identify the need for innovation and change management in e-governance. 4c. Identify the issues related with corruption in e-governance.	4.1 Architecture and models of e-governance i.e. The Broadcasting Model, Critical Flow Model including Public Private Partnership (PPP).. 4.2 Need for innovation and change management in e-governance 4.3 Major issues including corruption in e-governance .	04
5. Digital India and Security for e-Government	5a. Identify various key vision areas of Digital India. 5b. Analyze the concept of nine pillars of Digital India. 5c. Determine the strategies to create own Digital Lockers and e-sign. 5d. Identify the Security Management Model based on the Security Standards.	5.1 Digital India : the Umbrella Programme, Key Vision Areas, Participation in digital & financial space through mobiles and Banking . 5.2 Nine pillars of Digital India, e-Governance related Policies, Digital Lockers and e-Sign 5.3 Challenges and Approach of E-government Security. 5.4 Security Management Model	06
6. Case Studies in e-Governance	6a. Analyze different Laws of e-Governance in the Indian Context. 6b. Select case studies in e-governance based on Services provided by NIC. 6c. Identify the Role of NIC center of the	6.1 Indian Context: Cyber Laws, Implementation in the Land Reform, Human Resource Management Software. 6.2 NIC-NET, Collectorate, Computer-aided Administration of Registration Department (CARD), Smart Nagarpalika, National Reservoir Level and Capacity Monitoring System,	06

	district from the given.	Computerization in Maharashtra, Ekal Seva Kendra, Sachivalaya Vahini, Bhoomi, IT in Judiciary, E-Khazana, Directorate General of Foreign Trade (DGFT), PRAJA, E-Seva, E-Panchyat. 6.3 General Information Services of National Informatics Centre (NIC).	
		Total Hrs	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to E-Governance	02(00)	02(00)	00(00)	04(00)
2	E-Governance Infrastructure and Strategies	01(00)	02(00)	02(01)	05(01)
3	Cyber Security in E-Governance	01(00)	01(00)	04(01)	06(01)
4	Architecture and models of e-governance	00(00)	02(01)	03(00)	05(01)
5	Digital India and Security for e-Government	01(00)	02(00)	03(01)	06(01)
6	Case Studies in e-governance	01(00)	00(01)	03(00)	04(01)
	Total	06(00)	09(02)	15(03)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M-Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	R	1	1	U	1	1	U	1	2	R	1	30/35
	2	U	1	2	U	1	2	A	1	2	A	1	2	A	1	
	3	R	1	3	U	1	3	A	1	3	A	1	3	A	1	
	3	A	1	3	A	1	4	U	1	4	U	1	4	U	1	
	4	A	1	4	A	1	4	A	1	5	R	1	5	A	1	
	5	U	1	5	U	1	5	A	1	5	A	1	5	A	1	
	6	R	1	6	U	1	6	A	1	6	A	1	6	A	1	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assignments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1,2,3,4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

Nil

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	
	1	2	3	4	5	6	7	1	2	
1	3	3	3	3	-	-	3	3	-	
2	3	3	-	-	-	-	3	-	-	-
3	3	-	3	3	-	-	-	3	-	-
4	3	3	3	3	-	-	3	3	-	-
5	3	3	3	3	-	-	-	3	-	-
6	3	3	3	-	-	-	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N .	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Managing Transformation-Objectives to Outcomes	J Satyanarayana, Prentice Hall, India	13:9788120345379
2	The state, IT and Development.	Kenneth Kenniston, R K Bagga and Rohit Raj Mathur Sage Publications India Pvt. Ltd.	9780761933991
3	e-Government – The Science of the Possible	J Satyanarayana, Prentice Hall, India	13:9780134195728

❖ E-REFERENCES:

- <https://www.csi-sigegov.org.in/publications.php> accessed on 22/06/2022
- <https://negd.gov.in> accessed on 27/07/2022
- <https://www.nisg.org> accessed on 03/08/2022

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:

NIL

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr.M.A.Rahman	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mr.A.A.Uike	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mr.P.S.Thakre	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr. Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr. Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : **DIPLOMA IN AE/ME/CE/EE/PK/MT/TX/IT/CM/MC/ AI/EC/TR**

COURSE CATEGORY: **OPEN ELECTIVE COURSE**

COURSE CODE : **OE204G**

COURSE TITLE : **CYBER SECURITIES AND LAWS****

TEACHING SCHEME: **TH: 02; TU: 00;PR: 00 (CLOCK HRs.)**

TOTAL CREDITS : **02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)**

TH. TEE EXAM : **01HR (Objective Type Online Examination)**

PR. TEE EXAM : **--**

PT. EXAM : **20 MINUTES (Objective Type)**

❖ **RATIONALE:**

The increase of internet use is leading towards the frauds/ illegal activities on the internet. It is need of time to understand the various cyber crimes and importance of Cyber Securities in order to protect personal, governmental, organisational property/ data/information systems. Also it is need to understand various cyber laws/ laws of internet, that are deals with crimes related to cyber space.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify different types of cyber organized crime.
2. Analyze the planning, risk events and concept of cyber attacks.
3. Identify the tools that used in cyber crimes.
4. Identify types of Cybercrimes related with mobile and wireless Devices.
5. Analyze the conceptual foundation of cyber security awareness.

6. Identify different laws and concepts of Cyber security .

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to Cyber Crime	1a. Choose the meaning of given term. 1b. Identify criminals, that are related with given cyber crimes. 1c. Identify a type of cybercrime done in given statements.	1.1 Cyber Crime: Definitions, An origin of the Word, cybercrime and information security, email bombing, mail bombs 1.2 Criminals in cybercrime, classification of cyber-crimes; cyber defamation, internet time theft 1.3 Hacking, online fraud, software piracy, 1.4 password sniffing, Identity theft	04
2. Planning of Cyber Attack	2a. Select type of cyber-attacks in given statement. 2b. Choose features of social engineering. from given statements. 2c. Select from given statements, that showing cyber stalking. 2d. Analyse given statements and Identify use of cloud computing in cybercrime.	2.1 Attacks: passive and active attacks, scamming/scrutinizing gathered information, attack access, Gaining/maintaining the system 2.2 Social engineering, classification of social engineering, 2.3 Cyber stalking: types of stalkers, stalking of cyber stalking, Real life incidents of cyber stalking, 2.4 Cloud computing: why cloud computing? types of services, cyber-crime and cloud computing..	06
3. Tools and Methods Used in Cyber Crime	3a. Analyse given statements and Identify role of proxy servers in cyber crimes. 3b. Identify strong passwords and weak passwords from given samples of password. 3c. Identify types of virus used for given cyber crimes. 3d. Identify used fishing method in given cyber crime.	3.1 Introduction proxy servers 3.2 Password cracking - online attacks, offline attacks, strong, weak and random password, random password, 3.3 Virus and worms, types of virus, Trojan horse and backdoors: backdoors, protection from Trojan horse, 3.4 Phishing –Definition, methods of phishing, types of phishing scams,	04

4. Cyber Crime: Mobile/Wireless Devices	4a. Identify technique used for given cyber crime. 4b. Select from given statements, that showing API security for mobile devices. 4c. Select from given statements that can be possibility of cybercrime for mobile devices. 4d. Identify measures for protecting data on lost devices from given statements.	4.1 Credit card/debit card fraud in mobile and wireless computing era-types and technique of credit card fraud, 4.2 Mobile devices: Media player control security, networking API security for mobile devices 4.3 Applications and software :mobile viruses, Securities from mobile computing applications, hacking Bluetooth mobile devices, 4.4 A Threats through stolen devices, Protecting data on lost devices, device related security issues, organizational security policies and measures in mobile computing era.	06
5. Cyber Crimes and Need for Cyber-Security	5a. Analyze given statements and identify performed online cybercrime. 5b. Analyse given statements and select type of cybercrime related with given sector. 5c. Identify use of patents and trademarks from given statement. 5d. Analyze given statements and select importance/need of cyber laws from given options.	5.1 Online Scams: Charity scam, lottery Scam, Fake offer/fake job scam 5.2 Examples of cyber-crimes: Indian case of online gambling, banking related frauds 5.3 Intellectual Property in Cyber space, Patent copyright, trademark, domain name 5.4 The legal Scenario and perspectives - Introduction, cybercrime and the legal base for cybercrime around world, Importance and need cyber laws	06
6. Cyber Laws and Way Forward	6a. Analyze given statements and select feature relevant with IT Act 2000. 6b. Select from given options that denotes the various changes made in IT ACT. 6c. Identify challenges of Indian law and cybercrime in India, from given statements.	6.1 Cyber laws in INDIA:IT ACT-2000, Positive aspects of IT ACT 2000, Weak areas in IT ACT 2000 6.2 Amendments In cyber laws: changes made in IT ACT, state Government's power impacted by amendment in IT ACT 6.3 Challenges : challenges of Indian law and cyber-crime scenario in India, Information Technology ACT and its influence, digital signature and the Indian ACT,	06

	6d. Identify from given statements that denotes punishment for given Cybercrime.	6.4 Punishment: cybercrime and punishment, Information technology and students technology and students: An Indian Scenario	
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

	NIL		
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❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction	02(01)	02(00)	01(00)	05(01)
2	Planning of cyber Attack	01(00)	02(00)	02(01)	05(01)
3	Tools and methods used in Cyber crime	01(00)	01(00)	03(01)	05(01)
4	Cyber Crime: Mobile/wireless devices	01(00)	01(00)	03(01)	05(01)
5	Cybercrimes and need for Cyber-security	02(00)	01(00)	02(00)	05(00)
6	Cyber Laws and Way forward	01(00)	02(01)	02(00)	05(01)
	Total	08(01)	09(01)	13(03)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L- Level of Question

M-Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R1 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 1 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
Q.NO.01- Q.NO.35	1	R	1	1	R	1	1	U	1	1	U	1	1	A	1	1	R	1	30/35
	2	R	1	2	U	1	2	U	1	2	A	1	2	A	1	2	A	1	
	3	R	1	3	U	1	3	A	1	3	A	1	3	A	1	3	A	1	
	4	R	1	4	U	1	4	A	1	4	A	1	4	A	1	4	A	1	
	5	R	1	5	R	1	5	U	1	5	A	1	5	A	1	6	R	1	
	6	U	1	6	U	1	6	A	1	6	A	1	6	U	1				

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	-	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	-	--	Journal	1, 2, 3,4,5,6
				Total	-	-		
	TEE (Term End Examination)	End Exam	Students	End of the Course	-	-	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

	Nil	
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❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	3	-	-	2	-	3	-	-	-
2	3	3	-	-	2	-	3	-	-	-
3	3	3	-	-	2	-	3	-	-	-
4	3	2	-	-	2	-	3	-	-	-
5	3	2	-	-	2	-	3	-	-	-
6	3	2	-	-	2	-	3	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	"Cyber Security" - Understanding Cybercrime, Computer forensic and legal perspective.	Nina Godbole, Sunil Belapure, Wiley India Pvt. Ltd Reprint, 2018	978-81-265-2179-1
2	"Cyber security Managing systems- Conducting, Testing and Investigating Intrusion",	Thomas J. Mowbray, Wiley India Pvt. Ltd Reprint, 2018	81-219-2440-5

❖ E-REFERENCES:

- <https://www.youtube.com/watch?v=KqSqyKwVuA8> accessed on 25th January 2022
- <https://www.youtube.com/watch?v=PIHnamdwGmw> accessed on 27th January 2022
- <https://www.youtube.com/watch?v=fQ3ESFfvchg&list=PLUtfVcbiqn834VGI9faVXGIGSDXZMGp8> accessed on 27th January 2022

❖ LIST OF MAJOR EQUIPMENTS / INSTRUMENTS WITH SPECIFICATION:

Nil

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Dr.A.R.Mahajan	Head of Department (I.T.Dept.).	Government Polytechnic, Nagpur.
2	Mr.L.L.Bhadekar	Lecturer in IT	Government Polytechnic, Nagpur.
3	Mrs.Shifa Mohammed Azharuddin	Lecturer in IT	Government Polytechnic, Nagpur.
4	Mr. Dipak Dhote, Industry Expert	Operations Manager, IT-Network Infosystems Pvt. LTD.	IT-Network Infosystems Pvt. LTD.
5	Dr. Rakesh Kadu, Member from Academics(External)	Assistant Professor, I.T., Ramdeobaba College of Engg, and Management, Nagpur.	Ramdeobaba College of Engg, and Management, Nagpur.
6	Mrs.V.A. Raje,MSBTE Nominee	Lecturer in C.O., G.P. Arvi	G. P. Arvi
7	Mr. L.D.Vilhekar, Member (Internal)	Lecturer in Information Tech.	Government Polytechnic, Nagpur.
8	Mrs.D.P.Chanmanwar, Member (Internal)	Lecturer in Information Tech.	Government Polytechnic, Nagpur.
9	Mr.M.N.Gawande, CDC In Charge and Member Secretary	Lecturer in Electrical Engg.	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/EE/EC/CM/IT/MT/MC/PK/AE/TR/TX
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE206G
COURSE TITLE	: ENERGY WASTE MANAGEMENT**
TEACHING SCHEME	: TH:02; TU: 00;PR: 00(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 02 HRs (Online Examination)
PR. TEE EXAM	: --
PT. EXAM	: 20 Min(MCQ)

❖ RATIONALE:

The objective of the course is to provide insight into waste management options by reducing the waste destined for disposal and encouraging the use of waste as a resource for alternate energy production. This course is designed to provide an understanding of the various aspect of waste to Energy. The various sources of waste generation is analyzed with a focus on its potential for energy production. The need for characterization of waste will be discussed along with the existing norms for waste utilization for alternate energy source. Case studies will be discussed to provide a better understanding of the concept of “Waste to Energy “in the Indian context.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify sources of waste energy in various field
2. Choose appropriate process of heat recovery from waste energy in various field
3. Apply the concept of waste to energy in various field of engineering
4. Analyze the present scenario of conventional and non conventional energy in India.
5. Identify the environment friendly technologies to manage waste energy
6. Analysis of case studies for understanding success and failures.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction	1a. Define Principle of waste management 1b. Describe 3-R Principle of waste management. 1c. List different sources of waste energy in different sector	1.1 Principle of waste management and waste utilization 1.2 3-R Principle of waste management, • Reduce • Reuse and • Recycle 1.3 Sources waste energy such as domestic, industrial, agriculture, post-consumer waste etc.	04
2. Conversion of Waste to Energy	2a. Describe biochemical conversion 2b. Explain Thermo chemical conversion 2c. Identify sources of heat recovery from boiler	2.1 Bio chemical Conversion, energy production from organic waste through anaerobic digestion and fermentation 2.2 Thermo chemical Conversion – Combustion incineration and heat recovery pyrolysis, gasification. 2.3 Waste heat recovery from boiler	06
3. Waste heat Recovery , Cogeneration and Trigeneneration	3a. State need of waste heat recovery of the given thermal power plant 3b. Illustrate with neat sketches working principle of cogeneration and trigeneneration	3.1 Construction and working of thermal power plant and waste heat recovery in thermal power plant : need, opportunities and present practices 3.2 Cogeneration and Trigeneneration: need, opportunities and present practices	06
4. Renewable Sources of Energy	4a. List different sources of renewable energy. 4b. Compare energy consumption in India by conventional and non conventional energy	4.1 Introduction to renewable source of energy and different sources of renewable energy likesolar, wind, tidal, geothermal etc. 4.2 Present scenario of conventional and non conventional energy in India	06
5. Waste to Energy and Environmental Implication	5a. State standards for Environment standard 5b. List benefits of non renewable energy 5c. State importance of Carbon Credit	5.1 Environmental standards for waste to energy 5.2 Saving on non renewable fuel resources 5.3 Introduction to carbon credit	05

6. Case Study. (Scenario of Waste to Energy)	Case Studies –(on any one topic) 6a. Success/failures of Indian waste to energy Plants 6b. Global Best Practices in Waste to energy production distribution and use. 6c. Indian Scenario on Waste to Energy production distribution and use in India. 6d. Role of the Government in promoting 'Waste to Energy	6.1 Success/ failure waste to energy 6.2 Global based practices in waste to energy production, distribution and use 6.3 Indian Scenario on waste to energy 6.4 Role of government in promoting waste to energy (Case study on the basis of waste to energy)	05
Total Hrs			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS: Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction.	00(00)	04(00)	00(00)	04(00)
2	Conversion of Waste to Energy	00(00)	03(00)	03(00)	06(00)
3	Waste Energy utilization in power plant	02(00)	04(00)	00(02)	06(02)
4	Renewable sources of Energy	00(01)	00(00)	04(00)	04(01)
5	Waste to Energy and Environmental Implication	00(00)	00(02)	05(00)	05(02)
6	Case Study.	00(00)	00(00)	05(00)	05(00)
	Total	02(01)	11(02)	17(02)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q.01 to Q.35	1	U	1	1	A	1	1	U	1	1	U	1	1	U	1	30/35
	2	U	1	2	U	1	2	A	1	2	A	1	2	A	1	
	3	R	1	3	R	1	3	U	1	3	A	1	3	U	1	
	4	R	1	4	A	1	4	A	1	4	A	1	4	A	1	
	5	A	1	5	A	1	5	U	1	5	A	1	5	A	1	
	6	A	1	6	A	1	6	A	1	6	A	1	6	A	1	

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
	Nil	

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO
	1	2	3	4	5	6	7	1	2
1	3	3	-	-	3	-	3	3	-
2	3	3	3	-	3	-	3	3	-
3	3	3	3	-	3	-	3	3	-
4	3	3		-	3	-	3	3	-
5	3	3	3	-	3	-	3	3	-
6	3	3	3	-	3	1	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

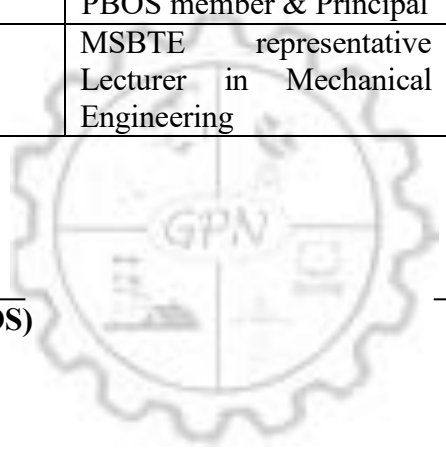
S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Integrated Waste Management in India. Status and Future Prospects for Environmental Sustainability.	Marimuthu Prashanthi, Rajakumar Sundaram.	978-3319272269
2	Solid Waste Management Present and future challenges	Jagbir Singh, AL. Ramanathan	978-9389447927
3	Solid Waste Management in Indian Cities: Status and Emerging Practices	Darshini Mahadevia, Jeanne M. Wolfe	978-818069522
4	Renewable energy sources and Emerging Technologies	D.P.Kothari, K.C. Singal, Rakesh Ranjan	978-9389347890
5	Thermal Engineering	R.S.Khurmi, J.K.Gupta	978-8121925730
6	Thermal Engineering	R.K.Rajput	978-8131808047

❖ E-REFERENCES:

- <https://www.youtube.com/watch?v=HA3pjvUMVY0>
- <https://www.youtube.com/watch?v=XHi7kV-ZMT0>
- <https://www.youtube.com/watch?v=DROZUstnsnw>
- <https://www.youtube.com/watch?v=1w9Qp61BsNg>
- www.teriin.org/projects/green/pdf/National-Waste.pdf

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Dr. R. G. Choudhari	HOD, Mechanical Engineering	Government Polytechnic, Nagpur
2	Mr.T .K Ghormade	Course Expert & Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur
3	Dr. M .M .Pawde	Course Expert & Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur
4	Er. A.M.Onkar	PBOS member & Chief Executive Officer	Onkar Furnitures, MIDC, Nagpur
5	Shri. G.F.Potbhare	PBOS member & Principal	NIT, Polytechnic, Nagpur
6	Shri G.H. Dahole	MSBTE representative Lecturer in Mechanical Engineering	Govt. Polytechnic, Gondia


 (Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/EE/EC/CM/IT/MT/MC/PK/AE/TR/TX
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE207G
COURSE TITLE	: TOTAL QUALITY MANAGEMENT**
TEACHING SCHEME	: TH:02; TU: 00;PR: 00(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 02 HRs (Online Examination)
PR. TEE EXAM	: --
PT. EXAM	: 20 Min (MCQ)

❖ RATIONALE:

The success of any organization not only depends on quality of its products and services but also depends on the people working in it. Total quality management (TQM) is a philosophy, methodology aimed to create and maintain mechanism of organization's continuous improvement to achieve total quality. This course deals with the methods through which the needs and expectations of the customer and the objectives of the organization are satisfied in most efficient and cost-effective manner. After studying this course, the diploma technicians shall be able to improve and maintain the quality of products and services through ongoing refinements in the organization he/she serving.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Describe the dimensional barrier regarding Quality.
2. Summarize the Total quality principles.
3. Demonstrate the tools utilization for quality improvement.
4. Discover the new decision of principle in real time projects.
5. Analyze the various types of techniques used to measure quality.
6. Apply the various quality systems in implementation of TQM.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to TQM	1a. Describe evolution of quality 1b. Identify concepts of TQM 1c. Illustrate barriers while implementing TQM	1.1 Introduction - Need for quality - Evolution of quality - Definition of quality 1.2 Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – 1.3 TQM Framework - Contributions of Deming, Juran and Crosby, Component of TQM, Obstacles to Quality	06
2. TQM Principles	2a. Describe leadership and quality aspects 2b. Describe roll of employee in TQM. 2c. Describe various continuous improvement processes. 2d. Describe the term supplier and justify how supplier rating.	2.1 Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention – 2.2 Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal 2.3 Continuous process improvement – PDCA cycle, 5s, Kaizen 2.4 Supplier partnership – Partnering, Supplier selection, Supplier Rating.	05
3. TQM Tools and Techniques – I	3a Describe tools of quality. 3b Describe six sigma process. 3c State applications of Six sigma 3d Justify benchmarking and describe it.	3.1 The seven traditional tools of quality – New management tools. 3.2 Six-sigma – Concepts, methodology, applications to manufacturing, service sector. 3.2 Bench marking –Reason to bench mark, Bench marking process	05
4. TQM tools and Techniques – II	4a. Describe Quality circle, QFD, Taguchi quality loss function and TPM 4b. Describe performance measure and improvement needs 4c. State the Method of Fish Bone as decision making model 4d. Demonstrate problem solving with the use	4.1 Quality circles – Quality Function Deployment (Introduction) TPM Concepts (Introduction), 4.2 Quality improvement needs –JIT, Cost of Quality – Performance measures. 4.3 Various TQM tools: Cause-and-effect diagram (fishbone or Ishikawa diagram), Check sheet, Histogram, Pareto chart	05

	of quality tools		
5. Quality Systems	5a Justify need of quality system ISO 9000 5b Describe quality auditing QS 9000. 5c List factors responsible for TQM implementation in manufacturing and service sector.	5.1 Need for ISO 9000- ISO 9000-2000 Quality System, Eight principles of ISO 5.2 Quality auditing, QS 9000, ISO 14000 – Concepts, 5.3 Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors	05
6. Implementation of TQM	6a. State scope of total quality implementation. 6b. Describe achievements through TQM 6c. Describe need of multi skilled worker, YO-I-DON 6d. Justify importance of KANBAN system, in quality.	6.1 Road map for TQM Implementation. 6.2 Lean Manufacturing (Introduction), Productivity –Seven Deadly Wastes 6.3 Single unit production "YO-I-DON" & standardization, Need of multi-skilled worker. 6.4 Quality production through KANBAN system and KANBAN rules.	06
Total Hrs			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to TQM	00(00)	04(00)	00(00)	04(00)
2	TQM Principles	00(00)	03(00)	03(00)	06(00)
3	TQM tools and Techniques – I	02(00)	04(00)	00(02)	06(02)
4	TQM tools and Techniques - II	00(01)	00(00)	04(00)	04(01)
5	Quality Systems	00(00)	00(02)	05(00)	05(02)
6	Implementation of TQM	00(00)	00(00)	05(00)	05(00)
	Total	02(01)	11(02)	17(02)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q.01 to Q.35	1	U	1	1	A	1	1	U	1	1	U	1	1	U	1	30/35
	2	U	1	2	U	1	2	A	1	2	A	1	2	A	1	
	3	R	1	3	R	1	3	U	1	3	A	1	3	U	1	
	4	R	1	4	A	1	4	A	1	4	A	1	4	A	1	
	5	A	1	5	A	1	5	U	1	5	A	1	5	A	1	
	6	A	1	6	A	1	6	A	1	6	A	1	6	A	1	

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 1 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 1 Marks

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3,4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Nil	

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO
	1	2	3	4	5	6	7	1	2
1	3	3	-	-	3	-	3	3	-
2	3	3	3	-	3	-	3	3	-
3	3	3	3	-	3	-	3	3	-
4	3	3		-	3	-	3	3	-
5	3	3	3	-	3	-	3	3	-
6	3	3	3	-	3	2	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	TQM-Total Quality Management	Arasu Senthil B, Paul Praveen I Scitech Publications (India) Pvt. Ltd., Chennai, 2015	ISBN: 978-81-8371-578-2
2	Quality Assurance and Total Quality Management (ISO-9000, QS-9000, ISO-14000)	Jain K C, Chitale A K Khanna Publishers, New Delhi, 2005,	ISBN: 9788174091741
3	TQM and ISO 14000	Arora K C S.K. Kataria & Sons, New Delhi 2014,	ISBN: 9788185749990
4	Quality Management for Organizational Excellence: Introduction to Total Quality, 8th Ed	Goetsch & Davis, Publisher: Prentice Hall	ISBN: 978-0-13-379185-3

❖ E-REFERENCES:

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- <https://www.asq.org/learn-about-quality/total-qualitymanagement/overview/>
- <https://www.hgint.com/tqm-total-quality-management-software/>
- <https://www.books.google.co.in/books?isbn=817758412X>
- <https://www.www.educba.com> > Courses > Business > Management
- <https://www.managementhelp.org/quality/total-quality-management.htm>

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

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2	Dr. R. G. Choudhari	HOD, Mechanical Engineering	Government Polytechnic, Nagpur
3	Mr.S. R. Kaduskar	Course Expert & Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.
4	Mr. A.S. Bahendwar	Course Expert & Lecturer in Mechanical Engg	Government Polytechnic, Nagpur.
5	Mr.S. B. Bambole	Course Expert & Lecturer in Mechanical Engg	Government Polytechnic, Nagpur.
6	Er. Mr. A.M.Onkar	PBOS member & Chief Executive Officer	Onkar Furnitures, MIDC, Nagpur
7	Shri. G.F.Potbhare	PBOS member & Principal	NIT, Polytechnic, Nagpur
8	Shri G.H. Dahole	MSBTE representative Lecturer in Mechanical Engineering	Govt. Polytechnic, Gondia

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/ME/CE/EE/PK/MT/TX/IT/CM/ MC/AI/EC/TR
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE208G
COURSE TITLE	: ADDITIVE MANUFACTURING & 3D PRINTING**
TEACHING SCHEME	: TH:02; TU: 00;PR: 00(CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HR (Objective Type Online Examination)
PR. TEE EXAM	: -
PT. EXAM	: 20 Min (Objective Type)

❖ RATIONALE:

Additive manufacturing is a comparatively recent and advanced manufacturing technique that is becoming a key area of interest in every industrial field. Additive Manufacturing (AM) is the process of joining materials to create components from computer aided design (CAD) model data, and typically layer by layer, as opposed to subtractive manufacturing methods. Additive manufacturing is sometimes referred to as 3D printing, additive manufacturing, or freeform manufacturing. Additive manufacturing is a revolutionary unique method of producing components directly from the digital CAD model using a layer-by - layer material build-up technique. This tool-less manufacturing method can manufacture completely dense metal parts in less time, with high precision and accuracy. Advantages of additive manufacturing are, including the freedom of part design, part complexity, light weighting, part consolidation and function design, which generate specific interest in metal additive manufacturing for aerospace, oil & gas, marine and automotive applications and many more.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify the Different 3D printing Technology and machines used in Additive manufacturing.
2. Select suitable Machine and Material for printing.
3. Describe the CAD Modeling.

4. Different applications of Additive manufacturing.
5. Select the different equipments in Additive manufacturing.
6. Describe the concept of Post processing.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to Additive Manufacturing and 3D Printing Technology	1a. Describe given trends shaping the evaluation of 3D printing. 1b. Describe the Technology improvement. 1c. Classify the Additive Manufacturing Systems on given basis with advantages and disadvantages.	1.1 Development of Additive Manufacturing 1.1.1 Major trends shaping the evaluation of 3D printing 1.1.2 Technology Improvement Process 1.2 Classification of Additive Manufacturing Systems 1.2.1 Advantages and Limitations: 1.2.2 Additive V/S Conventional Manufacturing Processes.	05
2. CAD for Additive Manufacturing	2a. Prepare the given CAD Models. 2b. Describe the STL File Manipulation and given Additional Software to Assist AM. 2c. Describe the given Additive Manufacturing File Forma.	2.1 Introduction 2.1.1 Preparation of CAD Models: The STL File 2.1.2 Problems with STL Files 2.1.3 STL File Manipulation 2.2 Additional Software to Assist AM 2.3 The Additive Manufacturing File Format	05
3. Materials in Additive Manufacturing	3a. Describe the methods for Choosing Materials for Manufacturing. 3b. Describe the given Composite Materials. 3c. Describe the Ceramics & the given Materials.	3.1 Choosing Materials for Manufacturing 3.1.1 Multiple Materials 3.1.2 Metal AM Processes & Materials 3.2 Composite Materials 3.2.1 Biomaterials, Hierarchical Materials & Biomimetics. 3.2.2 Ceramics & Bio-ceramics 3.3 3 D Printing & Bio-Active Materials	06
4. Applications and Examples	4a. Describe the given Material Relationship. 4b. Describe the Applications in the given Engineering field. 4c. Describe the Applications in given Industry.	4.1 Application - Material Relationship 4.1.1 Applications in Design 4.2 Applications in Engineering, Analysis and Planning 4.3 Applications in Manufacturing	06

	4d. Describe the Applications in given Arts and Architecture.	and Tooling 4.4 Applications in Aerospace Industry 4.4.1 Applications in Automotive Industry 4.4.2 Applications in Jeweler Industry 4.4.3 Applications in Arts and Architecture	
5. Additive Manufacturing Equipment	5a. Describe the given Process Equipment Design and process parameters. 5b. Describe given Bonding Mechanism. 5c. List Common Faults and Troubleshooting. 5d. State the given Process design.	5.1 Process Equipment- Design and process parameters 5.2 Governing Bonding Mechanism 5.3 Common Faults and Troubleshooting. 5.4 Process design	05
6. Post Processing	6a. Describe the given Support 6b. Material Removal process. 6c. Describe the process of given Improvements. 6d. Describe Property Enhancements using the given Techniques.	6.1 Support Material Removal 6.2 Surface Texture Improvements 6.2.1 Accuracy Improvements 6.2.2 Aesthetic Improvements 6.3 Property Enhancements Using Non-thermal Techniques 6.3.1 Property Enhancements Using Thermal Techniques.	05
Total			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Additive Manufacturing and 3D Printing Technology	02(00)	00(00)	02(00)	04(00)
2	CAD for Additive Manufacturing	01(00)	02(00)	03(01)	06(01)
3	Materials in Additive Manufacturing	02(00)	02(01)	02(00)	06(01)
4	Applications and Examples	00(01)	02(00)	02(00)	04(01)
5	Additive Manufacturing Equipment	00(00)	02(01)	02(00)	04(01)
6	Post Processing	02(00)	02(00)	02(01)	06(01)
Total		07(01)	10(02)	13(02)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1R2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	R	1	1	A	1	1	A	1	2	R	1	30/35
	2	U	1	2	U	1	2	A	1	2	A	1	2	A	1	
	2	A	1	3	R	1	3	R	1	3	U	1	3	U	1	
	3	U	1	3	A	1	3	A	1	4	R	1	4	U	1	
	4	U	1	4	A	1	4	A	1	5	U	1	5	U	1	
	5	U	1	5	A	1	5	A	1	6	R	1	6	R	1	
	6	U	1	6	U	1	6	A	1	6	A	1	6	A	1	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	-	3
2	3	-	2	-	3	-	3	3	3
3	3	-	2	-	3	-	3	3	3
4	3	1	-	3	3	-	3	3	3
5	3	-	-	3	3	-	3	-	3
6	3	-	-	3	3	-	3	-	3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N .	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Additive Manufacturing and 3D Printing Technology: Principles and Applications	Dr. G.K. Awari, Dr. D.P.Kothari, Prof. Vishwjeet Ambade, Dr. C. S. Thorat, CRC Press, Taylor & Francis Group	9780367436223
2	Additive Manufacturing Technologies 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing	Ian Gibson , David Rosen , Brent Stucker, Springer New York Heidelberg Dordrecht London	ISBN 978-1-4939-2112-6 ISBN 978-1-4939-2113-3 (eBook) DOI 10.1007/978-1-4939-2113-3
3	Additive Manufacturing Innovations, Advances, and Applications	T.S. Srivatsan , T.S. Sudarshan, CRC Press, Taylor & Francis Group	13: 978-1-4987-1478-5 (eBook - PDF)
4	Understanding Additive Manufacturing Rapid Prototyping · Rapid Tooling · Rapid Manufacturing	Andreas Gebhardt, Hanser Publishers, Munich Hanser Publications, Cincinnati	ISBN-13: 978-1-56990-507-4 (hardcover) ISBN-10:1-56990-507-X (hardcover)
5	Additive Manufacturing of Metals: The Technology, Materials, Design and Production	Li Yang •, Keng Hsu , Brian Baughman Donald Godfrey , Francisco Medina Mamballykalathil Menon Soeren Wiener, Springer Series in Advanced Manufacturing	ISBN 978-3-319-55127-2 ISBN 978-3-319-55128-9 (eBook) DOI 10.1007/978-3-319-55128-9

❖ E-REFERECNES:

- <https://www.youtube.com/watch?v=ICjQ0UzE2Ao>
- <https://www.youtube.com/watch?v=SfFIY0clCCA>
- <https://www.youtube.com/watch?v=PTcffCr19XY>
- <https://www.youtube.com/watch?v=5EMQdvfP7qs>
- <https://www.youtube.com/watch?v=o5sE2wn4qdw>
- https://www.youtube.com/watch?v=VyLHtaMDX_k

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Dr.G K Awari	Head of Automobile Engineering	Government Polytechnic, Nagpur.
2	Mr.S.D. Thakre	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3	Dr.K.S.Dixit	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4	Mr.S A Telang	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN ME/CE/EE/PK/MT/TX/IT/CM/
MC/AI/EC/TR

COURSE CATEGORY: OPEN ELECTIVE

COURSE CODE : OE210G

COURSE TITLE : RENEWABLE ENERGY SOURCES FOR MOBILITY**

TEACHING SCHEME: TH: 02; TU: 00; PR: 00(CLOCK HRs.)

TOTAL CREDITS : 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)

TH. TEEEXAM : 01 HRs (Objective Type Online Examination)

PR. TEEEXAM : --

PT. EXAM : 20 Min (Objective Type)

❖ RATIONALE:

World energy consumption steadily increases due to enhancement of quality of life, increase in transportation etc. Most of the energy demand can be fulfilled with the help of fossil fuels. Reservoirs of these fuels are limited. The aim of inclusion of this subject in the curriculum is to develop the ability in the student to develop the renewable energy sources so as to reduce the dependability on the nonrenewable power sources and improvements in engine performance and emission concern and their material compatibility concern. By using the renewable energy sources for vehicles can further reduce pollution and their overall carbon footprint by lowering greenhouse gas emissions from the vehicles.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify the renewable energy sources.
2. Select suitable bio-fuels for SI Engine vehicles.
3. Select suitable bio-fuels for CI Engine vehicles.
4. Analyze effect of blending of bio-fuels on performance and emission characteristics of the engines.

5. Compare the performance of Electric Vehicle with Conventional Engine driven vehicles.
6. Compare the performance of Fuel cells and solar operated vehicle with Conventional Engine driven vehicles.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Global Energy Review	1a. Compare global energy scenario with India on the basis of given points. 1b. Describe the given biomass conversion technologies. 1c. Describe the layout, applications, construction and working of given type of renewable energy sources.	1.1 Introduction to Energy Sources. Global Energy Sources and the Present Energy Situation. 1.2 Renewable Energy Sources, Biomass Energy and Biomass Conversion Technologies a. Layout, Applications, 1.3 Construction and working. • Hydropower • Geothermal Energy • Wind Energy • Solar Energy • Bio-hydrogen	05
2. Alternative Fuels for SI Engines	2a. Describe the Properties and modifications required in SI Engines to use given type of alternate Bio-Fuels (Alcohol Fuels). 2b. Describe the effect on Engine performance and emission Characteristics in SI Engines to use given type of alternate Biofuels (Gaseous Fuels).	2.1 Properties, Material Compatibility, effect on Engine performance and Emission Characteristics and Modifications required in SI Engines to use alternate Bio-Fuels (Alcohol Fuels): • Methanol • Ethanol • Propane • Butanol • Dimethyl Carbonate 2.2 Properties, Material Compatibility, effect on Engine performance and emission Characteristics and modifications required in SI Engines to use alternate Biofuels(Gaseous Fuels): • Producer Gas • Biogas • Bio-Syngas • Hydrogen	07

3. Alternative Fuels for a CI Engines	3a. Describe the Properties and modifications required in CI Engines to use given type of alternate Bio-Fuels. 3b. Describe effect of blending of the given type of bio- fuels on emission and performance of the CI Engines.	3.1 Properties, Material Compatibility, effect on engine performance and emission Characteristics and modifications required in CI Engines to use alternate Biofuels: Biodiesel Fischer–Tropsch Diesel Dimethyl Ether DiEthyl Ether 3.2 Blending of Bio-fuels and its effect on engine performance and emissions.	05
4. Bi-Fuel Vehicles	4a. Describe the given type of Bi-fuel vehicle layout, construction and working. 4b. Compare Bi-Fuelled Vehicles with Non-renewable Energy fuel Vehicles on the basis of given parameters. 4c. Draw the layout and describe the construction and working of given dual fuel vehicles. 4d. Compare Dual-Fuelled Vehicles with conventional Vehicles on the basis of given parameters.	4.1 Bi-Fuel Vehicles: Layout construction and working. 4.2 Comparison of Bi-Fuelled Vehicles with Non-renewable Energy fuel Vehicles and Conventional Vehicles. 4.3 Dual-Fuel Vehicles: Layout construction and working. 4.4 Comparison of Dual-Fuelled Vehicles with Non-renewable Energy fuel Vehicles and Conventional Vehicles.	05
5. Electrical and Hybrid Vehicles	5a. Draw the layout of given type of Electrical Vehicles and describe its construction and working. 5b. Compare the Hybrid vehicle with Conventional vehicles on the basis of given parameters.	5.1 Electric Vehicles: Layout, Components, construction, working advantages and disadvantages. 5.2 Hybrid Vehicle: Layout, Components, construction, working advantages and disadvantages.	05
6. Fuel Cell and Solar Operated Vehicles	6a. Compare fuel cell operated vehicle with conventional vehicle on the basis of given parameters. 6b. Draw a layout of given type of solar operated vehicles and describe its working principle. 6c. Justify the modifications required in conventional engine vehicle to implement the given type of renewable	6.1 Fuel Cell Vehicles: Types of Fuel Cells, Layout, Components, Working Principle of Fuel Cells, advantages and disadvantages. 6.2 Solar Operated Vehicles: Layout, Components, Working Principle of solar Vehicles, advantages and disadvantages.	05

	energy sources.	6.3 Modifications required in conventional vehicles to implement Fuel cell and solar renewable energy sources.	
Total			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Global Energy Review	02(00)	00(00)	00(00)	02(00)
2	Alternative Fuels for a SI Engines	01(00)	02(00)	05(01)	08(01)
3	Alternative Fuels for a CI Engines	01(00)	01(01)	02(00)	04(01)
4	Bi-Fuel Vehicles	00(01)	02(00)	02(00)	04(01)
5	Electrical and hybrid vehicles	00(00)	02(01)	02(00)	04(01)
6	Fuel Cell and Solar operated vehicles	03(00)	03(00)	02(01)	08(01)
	Total	07(01)	10(02)	13(02)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember,

Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	R	1	2	R	1	2	U	1	2	U	1	30/35
	2	A	1	2	A	1	2	A	1	2	A	1	2	A	1	
	2	A	1	3	R	1	3	U	1	3	U	1	3	A	1	
	3	A	1	4	R	1	4	U	1	4	U	1	4	A	1	
	4	A	1	5	U	1	5	U	1	5	U	1	5	A	1	
	5	A	1	6	R	1	6	R	1	6	U	1	6	U	1	
	6	U	1	6	R	1	6	A	1	6	A	1	6	A	1	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	-	3
2	3	-	2	-	3	-	3	3	3
3	3	-	2	-	3	-	3	3	3
4	3	1	-	3	3	-	3	3	3
5	3	-	-	3	3	-	3	-	3
6	3	-	-	3	3	-	3	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Alternative Fuels Guide book Properties, Storage, Dispensing, and Vehicle Facility Modifications	Richard L. Bechtold, RE, Society of Automotive Engineers, Inc. Warrendale, 1 st Edition, 2000	0-7680-0052-1
2	Biofuels and Bioenergy Processes and Technologies	Sunggyu Lee and Y. T. Shah, CRC Press Taylor & Francis Group, 1 st Edition, 2013	13: 978-1-4200-8956-1
3	Electric and Plug-In Hybrid Vehicles Advanced Simulation Methodologies	Bogdan Ovidiu Varga, Florin Mariasiu, Dan Moldovanu, Calin Iclodean, Springer-Verlag London Limited, 2015	978-3-319-18639-9
4	Alternative fuels and advanced vehicle technologies for improved Environmental performance Towards zero carbon transportation	Richard Folkson, Woodhead Publishing (Elsevier), 2 nd Edition, 2013	978-0-85709-742-2
5	Alternative Fuels for Transportation	Arumugam S. Ramadhas, CRC Press Taylor & Francis Group, 2013	13: 978-1-4398-1958-6
6	Alternative Transportation Fuels Utilization in Combustion Engines	York M. K. Gajendra Babu, K. A. Subramanian, CRC Press Taylor & Francis Group, 1 st Edition, 2013	13: 978-1-4398-7282-6
7	Biodiesel A Realistic Fuel Alternative for Diesel Engines	Ayhan Demirbas, Springer-Verlag London Limited, 2008	13: 9781846289941

8	Handbook of Alternative Fuel Technologies	Sunggyu Lee James G. Speight Sudarshan K. Loyalka, CRC PressTaylor & Francis Group 2013	13: 978-0-8247-4069-6
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❖ **E-REFERECNES:**

- https://www.youtube.com/watch?v=mh51mAUexK4&list=PLwdnzlV3ogoXUifhvYB651LJCZ74o_fAk dated 16th February 2022.
- https://www.youtube.com/watch?v=rK6Bey_loiw&list=PLdzIIxVTz4AsglVyHhZJ6Jj7tnpa3NL0n dated 16th February 2022.
- <https://www.youtube.com/watch?v=F2sZgWgvTAg> dated 16th February 2022.
- https://www.youtube.com/watch?v=wsz-LEFuLdc&list=PLLy_2iUCG87A7TdFpl6_xdgo-aYskxjXb dated 16th February 2022.
- <https://www.youtube.com/watch?v=L2VSOccUrSk> dated 16th February 2022.
- https://www.youtube.com/watch?v=QLN_6jPJgv0 dated 16th February 2022.
- <https://www.youtube.com/watch?v=LsWHqyjaD00> dated 16th February 2022.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

NIL

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.G.K.Awari	Head of Automobile Engineering	Government Polytechnic, Nagpur.
2	Mr.S.D.Thakre	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3	Dr.K.S.Dixit	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4	Mr.S.A.Telang	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5	Dr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AE/ME/CE/EE/PK/TX/IT/CM/MC/AI/EC/TR
COURSE CATEGORY: OPEN ELECTIVE COURSES
COURSE CODE : OE211G
COURSE TITLE : SELECTION OF MATERIALS**
TEACHING SCHEME: TH:02; TU:00;PR:00(CLOCK HRs.)
TOTAL CREDITS : 02 (1 TH/TU CREDIT=1 CLOCK HR.,1 PR CREDIT = 2 CLOCK HRs.)
TH. TEE : 01 HR (Objective Type Online Examination)
PR. TEE : --
PT. : 20 Min (Objective Type)

❖ RATIONALE:

Introducing a new engineering product or changing an existing model involves making designs, reaching economic decisions, selecting materials, choosing manufacturing processes, and assessing its environmental impact. These activities are interdependent. and materials and processes used in making the product can have a large influence on its design, cost, and performance in service. . Industries now emphasis on manufacturing products and goods locally, & how products affect the environment, and society. The aim of the subject is to enable judicious selection of material based upon the relationship between technical and economic facts.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Utilize different Material selection charts for various applications.
2. Interpret factors for selection process of different materials
3. Select materials for industrial applications depending on their properties
4. Select suitable biomaterials and magnetic materials for different applications.

❖ COURSE DETAILS:

A.THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Introduction	1a. State Principles involved in the selection of materials. 1b. Illustrate Selection criteria for required materials. 1c. Identify different material properties. 1d. Employ Material selection charts for various applications. 1e. Illustrate Factors affecting material prices, material substitution. 1f. Relate Strength vs. density & Young's modulus vs. density selection charts. 1g. Select material for various applications depending on the properties.	1.1 Principles involved in the selection of materials 1.2 Selection Criteria : Availability, Economics, Properties 1.3 Selection process, determination of performance requirements, Evaluation of alternatives 1.4 Material Properties: Chemical, Physical and Mechanical, properties in detail and limits on properties 1.5 Factors affecting material prices, material substitution 1.6 Material selection charts 1.7 Strength vs. density 1.8 Young's modulus vs. Density.	08
2. Functional Requirement of Engineering Materials	2a. State functional requirement of engineering materials. 2b. Select proper material required for different applications. 2c. Illustrate selection of materials for toughness. 2d. Assess toughness of different materials with suitable examples. 2e. Describe Creep Curve. 2f. Describe effect of stress and temperature on Creep. 2g. Select suitable non ferrous materials for given application. 2h. Draw Creep curve.	2.1 Selection of material for strength, resistance to corrosion – temperature -wears with practical examples 2.2 Materials selection for stiffness : Stiffness of engineering materials, Importance of stiffness, material selection criterion for stiffness with examples 2.3 Materials selection for toughness Toughness, Selection of materials for toughness, assessment of toughness of different materials with examples 2.4 Material selection for fatigue strength: Mechanisms, evaluation of fatigue life of different materials. 2.5 Material selection for creep : Mechanism, evaluation of creep resistance, Creep curve, Effect of	08

	2i. Recommend corrosion resistant materials for a given application .	stress and temperature, development of creep resistant alloys, selection criterion. 2.6 Selection of non ferrous materials.	
3. Selection of Materials for Different Applications	3a. Describe Tool steel & corrosion resistant steels. 3b. Identify properties required for materials for different applications. 3c. Define weldability, formability, and forgeability. 3d. Select proper materials for tools and components for various industrial applications. 3e. Select tool materials for various ore-dressing equipments. 3f. Recommend materials for various industrial and metallurgical applications.	3.1 High strength, heat resistant alloys, corrosion resistant steels required for good weldability, formability, forgeability, 3.2 Tool steels required for cutting, cold-working dies, hot working dies 3.3 Selection of materials and processes for tools and components of : a) automobile engines b) machine tools, c) foundry d) metal-working equipment, e) Testing machine,, f) ore-dressing equipment.	08
4. Magnetic Materials & Biomaterials	4a. Describe different properties of Magnetic materials. 4b. List various biomaterials. 4c. Compare different Biomaterials. 4d. State properties of Biomaterials. 4e. State applications of 4f. Magnetic materials . 4g. Select different Bio materials in various applications. 4h. Select Magnetic material for given application.	4.1 Introduction to magnetic materials 4.2 Types of Magnetic materials 4.3 Concept of Diamagnetism, paramagnetism and Ferromagnetism 4.4 Applications of Magnetic materials 4.5 Introduction to Biomaterials 4.6 Concept of Biocompatibility 4.7 Classification and applications of biomaterials	08
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

R – Remember

U – Understand

A – Analyze / Apply

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction	01(00)	03(00)	04(00)	08(00)
2	Functional requirement of engineering materials	02(00)	02(00)	04(01)	08(01)
3	Selection of materials for different applications	02(00)	02(02)	04(02)	08(04)
4	Introduction to magnetic materials & Biomaterials	01(00)	02(00)	03(00)	06(00)
	Total	06(00)	09(02)	15(03)	30(05)

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	R	1	1	U	1	1	U	1	2	R	1	30/35
	2	U	1	2	U	1	2	A	1	2	A	1	2	A	1	
	3	R	1	3	U	1	3	A	1	3	A	1	3	A	1	
	3	A	1	3	A	1	4	R	1	4	U	1	4	U	1	
	4	A	1	4	A	1	4	A	1	5	A	1	5	A	1	
	5	U	1	5	U	1	5	U	1	5	A	1	5	A	1	
	6	R	1	6	U	1	6	A	1	6	A	1	6	A	1	

T- Unit/Topic Number
R-RememberL- Level of Question
U-UnderstandM- Marks
A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:** Nil❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	
	1	2	3	4	5	6	7	1	2	
1	3	3	3	3	3		3			
2	3	3	3	3	3		3			
3	3		3	3	3		3			
4	3	4	3	3	3	3	3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Materials Selection in Mechanical Design	Mike Ashby , Butterworth-Heinemann, New Edition, 2011	9781856176637
2	Engineering Materials – Properties and Selection	Kenneth G. Budinski, Prentice-Hall of India, 1998	13:9780139047152
3	Materials and Process Selection for Engineering Design,	Mahmoud M. Farag Third Edition CRC Press, 2013	1466564091, 9781466564091
4	Mechanical Metallurgy	George E. Dieter, McGraw-Hill Education; 3 rd Edition, 1986	978-0070168930

❖ **E-REFERENCES:**

- <http://www.nptel.ac.in/courses/112104122/> , accessed on 14th July, 2021
- <https://www.youtube.com/watch?v=85HxmnLEkwM> , accessed on 14th July, 2021
- <https://www.youtube.com/watch?v=vnFN1loVJNY> , accessed on 14th July, 2021
- <https://www.youtube.com/watch?v=P-tg52VRzZU> , accessed on 14th July, 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:** Nil

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Shri.K.L.Meshram	HOD Metallurgical Engineering	Government Polytechnic, Nagpur.
2	Miss.V.C.Humney	Lecturer Metallurgical Engineering	Government Polytechnic, Nagpur.
3	Prof.YY.Mahajan	Assist. Professor , Metallurgy & Material Science	VNIT Nagpur
4	Shri.S.B.Varadpande	Managing Director	Orange city alloys Pvt. Ltd Nagpur
5	Shri.Y.K.Gaiky	Lecturer Mechanical Engineering	Government Polytechnic, Sakoli

(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN ME/CE/EE/PK/TX/IT/CM/MC/AI/EC/TR/AE COURSE

CATEGORY: OPEN ELECTIVE COURSES

COURSE CODE : OE212G

COURSE TITLE : NON DESTRUCTIVE TESTING

TEACHING SCHEME: TH:02; TU:00;PR:00(CLOCK HRs.)

TOTAL CREDITS : 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE : 01 HR (Objective Type Online Examination)

PR. TEE : -

PT. : 20 Min (Objective Type)

❖ RATIONALE:

Metallurgical engineering is a discipline that mainly deals with various metallic materials on the earth for the benefit of mankind. For that it is required to assess soundness of metallic materials during various stages of their formation. non Destructive Testing is essential to control and correlate various manufacturing parameters and also to decide suitability and predict probable behavior of metallic materials in practice. With the knowledge of non destructive testing procedures, students conduct various tests like ultrasonic, dye penetrant , magnetic tests, etc. and comment on soundness of materials

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Compare various NDTs .
2. Make use of DP and visual examination for crack detection.
3. Inspect metal products for defects using ultrasonic test.
4. Prepare sample for different NDT's to be carried out.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Scope of Testing	1a. State the need for NDT 1b. Discuss Different types of Types of non-destructive test. 1c. Select suitable NDT for proper application. 1d. Classify NDT methods.	1.1 Concept of non destructive testing Need of Non- destructive test 1.2 Introduction to NDT 1.3 Types of non-destructive test 1.4 Comparison of NDT with Destructive testing	05
2. Visual Examination, Dye Penetrant Tests	2a. State the need for visual Testing method. 2b. Select dye penetrant tests for crack detection. 2c. Enlist various types of developers used in DPT. 2d. Conduct DPT methods. 2e. Prepare Sample for conducting DPT. 2f. Select suitable developer for DPT.	2.1 Methods of Examination for defects: Visual examination, Hammer tests etc. 2.2 Penetrant tests, 2.3 Visual Optical methods, Dyepenetrant testing, Basic principle, Types of dye and methods of application, Developer application and Inspection.	09
3. Ultrasonic Testing	3a. Describe Ultrasonic testing in brief . 3b. Enlist types of transducers 3c. Discuss various probes used in UT. 3d. Conduct ultrasonic testing on metals. 3e. Prepare Sample for conducting UT.	3.1 Ultrasonic Testing: Fundamentals, Equipments, procedure and applications. Interpretation of results. 3.2 Ultrasonic testing: Basics of ultrasonic waves, Pulse and beam shapes,Ultrasonic transducers	09
4. Magnetic Particle Method	4a. Describe Magnetic analysis method of testing. 4b. Discuss yoke type magnetic particle testing.	4.1 Method based on magnetic analysis, yoke type , probe type magnetic crack detector 4.2 Magnetic particle testing, Basic theory of magnetism, Magnetization methods, Field indicators, Particle application, Inspection.	09

	4c. Discuss Various Magnetization methods.		
	4d. Conduct MPT methods.		
	4e. Prepare Sample for conducting MPT.		
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Scope Of Testing	01(00)	02(00)	03(01)	06(01)
2	Visual examination , Dye Penetrant tests	02(00)	02(00)	04(00)	08(00)
3	Ultrasonic Testing	02(00)	02(02)	04(01)	08(03)
4	Magnetic particle method	01(00)	03(00)	04(01)	08(01)
	Total	06(00)	09(02)	15(03)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
Q 01 To Q 35	1	R	1	1	R	1	1	U	1	1	U	1	1	R	1	30/35
	1	U	1	2	U	1	2	A	1	2	A	1	2	U	1	
	2	R	1	2	U	1	2	A	1	2	U	1	2	U	1	
	2	U	1	3	R	1	3	R	1	3	U	1	3	U	1	
	3	U	1	3	A	1	3	A	1	3	U	1	3	A	1	
	3	U	1	4	U	1	4	U	1	4	R	1	4	R	1	
	4	R	1	4	U	1	4	A	1	4	A	1	4	A	1	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION: Nil

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	PSO
	1	2	3	4	5	6	7	1	2	3
1	3			3	3	3	3	3		
2	3		3	3	3	3	3	3		
3	3	3		3	3	3	3	3		
4	3	3	3	3	3	3	3	3		

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Testing of materials	Prof. A.V.K. Suryanarayana. BS Publications/BSP Books , 2nd Edition, 2013	13 : 978-81-7800-134-0
2	The Testing of Engineering materials,	H. E. Davis, G. E. Troxell , Mcgraw Hill Publishing Company, Fourth Edition, 1982	81-7409-026-6
3	Mechanical Metallurgy	George Dieter, Mc Graw Hill, Third edition , March 2013	0-07-084453-4
4	Nondestructive Testing, Nondestructive Evaluation and Quality Control,	Louis Cartz, ASM International ASM Handbook, Vol. 17.	

❖ E-REFERENCES:

- <http://www.nptel.ac.in/courses/112106141/https://www.youtube.com/> accessed on 11th August, 2021
- <https://www.youtube.com/watch?v=D8U4G5kcpcM> , accessed on 11th August, 2020
- <https://www.youtube.com/watch?v=EeiwCbtJWyI> , accessed on 11th August, 2021
- <https://www.youtube.com/watch?v=dGT233GsqHE> , accessed on 11th August, 2021
- <https://www.nde-ed.org> , accessed on 04/01/2022
- <https://documents.pub/document/appreciation-to-ndt-31ppt.html>, accessed on 04th Jan 2022

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:

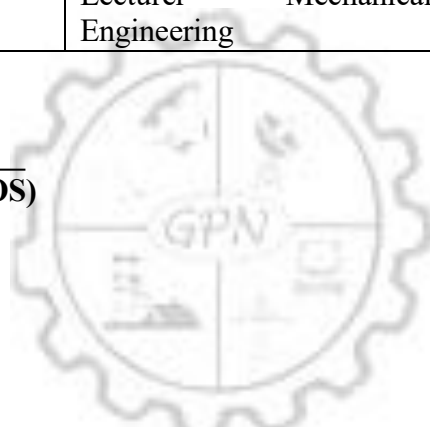
Nil.

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Mr.K.L.Meshram	HOD Metallurgical Engineering	Government Polytechnic, Nagpur.
2	Miss.V.C. Humney	Lecturer Metallurgical Engineering	Government Polytechnic, Nagpur.
3	Mr.S.M.Waikar	Lecturer Metallurgical Engineering	Government Polytechnic, Nagpur
4	Mr.Y.Y.Mahajan	Assist. Professor , Metallurgy & Material Science	VNIT Nagpur
5	Mr.S.B.Varadpande	Managing director	Orange city alloys Pvt. Ltd Nagpur
6	Mr.Y.K.Gaiky	Lecturer Mechanical Engineering	Government Polytechnic, Sakoli

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/AI/CE/CM/EC/IT/MC/ME/ MT/PK/TX/TR
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE215G
COURSE TITLE	: RENEWABLE ENERGY TECHNOLOGIES **
TEACHING SCHEME	: TH:02; TU: 00;PR: 00(CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HR (Objective Type Online Examination)
PR. TEE EXAM	: -
PT. EXAM	:20 Min (Objective Type)

❖ RATIONALE:

Renewable energy is crucial in improving climate on earth . Renewable technologies will also yield a pollution-free environment . All the world is now focusing on the generation of energy through renewable sources . This course is designed for diploma students to explore possibility of harnessing electrical energy from renewable sources such as Solar Thermal, Solar Photovoltaic, Wind, Biomass, other renewable sources .

❖ COURSE OUTCOMES:

After completing this course students will be able to—

1. Predict potential of renewable energy sources.
2. Apply various methods of solar energy harvesting.
3. Identify different parts of Wind power Plant.
4. Describe process of generation of electrical energy from Bio-Mass.
5. Compare Hydrogen Energy and Fuel cell with other sources of energy.
6. Describe principle of energy generation using different Renewable Energy Sources .

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Introduction	1a. Estimate reserve of given conventional sources of energy. 1b. Describe effects of usage of given conventional energy sources on environment. 1c. Predict potential of given renewable energy in world and India.	1.1 World Energy Use; Reserves of Energy Resources like coal, petroleum 1.2 Environmental Aspects of Conventional Energy Utilization 1.3 Renewable Energy Scenario in India and around the World, Potentials of Renewable Energy in world and India	04
2. Solar Energy	2a. Describe given terms related to Solar Radiation. 2b. Compare flat plate collectors and evacuated type collectors on given factors. 2c. Identify given type of solar panel . 2d. Justify need of Stand alone PV System.	2.1 Solar Radiation related terms and their meaning. 2.2 Working of Solar Water Heating System and types -Flat Plate and Evacuated Type 2.3 Definition of PV Cell ,Module, Array, Panel 2.4 Stand alone Solar PV System-Block Diagram and working	06
3. Wind Energy	3a. Compare types of Wind Turbine on given points. 3b. Identify given parts of a Wind Turbine. 3c. Select site for given type of Wind Turbine.	3.1 Wind Turbine -HAWT and VAWT 3.2 Working of Wind Power Plant 3.3 Site Selection for Wind Power Plant	06
4. Bio Energy	4a. Identify type of given biomass. 4b. Describe given terms related to gasifier. 4c. Identify given part of KVIC Biogas Plant. 4d. Select materials used in Ethanol production. 4e. Apply various steps in preparation of	4.1 Biomass and its types 4.2 Biomass Gasifier Definition and meaning of Dehydration, Pyrolysis, Combustion, Gasification 4.3 Working of KVIC Biogas Plants 4.4 Ethanol Production Method 4.5 Bio Diesel Production Method- Transesterification Method	04

	Biodiesel using given material.		
5. Hydrogen Energy and Fuel Cells	5a. Compare Hydrogen Fuel with given conventional energy source. 5b. Describe working of given components in Fuel Cells. 5c. Compare given types of Fuel Cells .	5.1 Hydrogen Energy -Advantages and Applications 5.2 Working of H ₂ O ₂ fuel cell 5.3 Compare types of Fuel Cell- PEM,AFC,PAFC,MCFC,SOFC,DM FC on operating temperature , power, efficiency , applications	06
6. Other Renewable Energy Sources	6a. Describe working of given Tidal Power Plant. 6b. Describe how electric power is generated from waves . 6c. Identify given type of Hydro Power Plant. 6d. Organize components of Micro Hydro Power Plant in a correct sequence.	6.1 Tidal Power Plant Block Diagram and Working 6.2 Energy Generation from waves – Block Diagram and Working 6.3 Block Diagram and Working of Hydropower Generation Types depending on rating -Large, Medium, Small, Mini, Micro on rating 6.4 Micro Hydro Power Project Layout and working	06
		Total Hrs	32

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction	02(00)	00(00)	00(00)	02(00)
2	Solar Energy	01(00)	02(00)	05(01)	08(01)
3	Wind Energy	01(00)	01(01)	02(00)	04(01)
4	Bio Energy	00(01)	02(00)	02(00)	04(01)
5	Hydrogen Energy and Fuel Cells	00(00)	02(01)	02(00)	04(01)
6	Other Renewable Energy Sources	03(00)	03(00)	02(01)	08(01)
	Total	07(01)	10(02)	13(02)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	R	1	2	R	1	2	U	1	2	U	1	30/35
	2	A	1	2	A	1	2	A	1	2	A	1	2	A	1	
	2	A	1	3	R	1	3	U	1	3	U	1	3	A	1	
	3	A	1	4	R	1	4	U	1	4	U	1	4	A	1	
	4	A	1	5	U	1	5	U	1	5	U	1	5	A	1	
	5	A	1	6	R	1	6	R	1	6	U	1	6	U	1	
	6	U	1	6	R	1	6	A	1	6	A	1	6	A	1	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

Nil

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	
	1	2	3	4	5	6	7	1	2	3
1	3				3		3			
2	3				3	1	3			
3	3				3		3			
4	3				3		3			
5	3				3		3			
6	3				3		3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Renewable Energy Technologies- A Practical guide for beginners	Chetan Singh Solanki, PHI Learning Pvt. Ltd., First, 2008.	978-81-203-3434-2
2	Solar Energy: Principles of Thermal Collection and Storage	S.P. Sukhatme, McGraw-Hill Education (India), 3rd Edition, 2009	10: 0070142963 13: 978-0070142961
3	Solar Photovoltaic: Fundamentals, Technologies & Application	Chetan Singh Solanki, PHI Learning Pvt. Ltd., 3rd Edition, 2015	8120351118, 978-81-203-5111-0
4	Wind Power Plants and Project Development	Joshua Earnest , Tore Wizelius, PHI Learning Pvt. Ltd., 2nd Edition, 2015	978-81-203-5127-1
5	Renewable Energy Sources and Emerging Technologies	D.P.Kothari, K.C.Singal, Rakesh Ranjan, PHI Learning Pvt. Ltd., 2nd Edition, 2015	978-81-203-4470-9
6	Solar Photovoltaic Technology and System: A Manual for Technicians, Trainers and Engineers	Chetan Singh Solanki, PHI Learning Pvt. Ltd., 5th Edition, 2016	978-81-203-4711-3

❖ E-REFERENCES:

- https://www.youtube.com/watch?v=Giek094C_l4&ab_channel=SmileandLearn-English, accessed on 6th November, 2021
- https://www.youtube.com/watch?v=4vPyA_wDM5c&ab_channel=A1ADVENTURE accessed on 6th November, 2021
- https://www.youtube.com/watch?v=3UafRz3QeO8&ab_channel=BioConstruct accessed on 6th November, 2021
- https://www.youtube.com/watch?v=qSWm_nprfqE&ab_channel=Lesics , accessed on 6th November, 2021
- https://www.youtube.com/watch?v=0oK_VQnPDuY&ab_channel=DeepakumarYadav , accessed on 6th November, 2021
- https://www.youtube.com/watch?v=iPheEg-K2qc&ab_channel=RealEngineering accessed on 6th November, 2021

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:

Nil

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Mr.A.M.Arekar	HoD, Electrical Engg.Deptt.	Government Polytechnic, Nagpur.
2	Dr.G.V.Gotmare	HoD, Electrical Engg. Deptt.	Government Polytechnic, Gondia
3	Mr.M.N.Gawande	Lecturer in Electrical Engg.	Government Polytechnic, Nagpur
4	Smt.A.A.Alegaonkar	Lecturer in Electrical Engg.	Government Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/AI/CE/CM/EC/IT/MC/ME/ MT/PK/TX/TR
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE216G
COURSE TITLE	: ENERGY CONSERVATION OPPORTUNITIES**
TEACHING SCHEME	: TH:02; TU: 00; PR: 00(CLOCK Hrs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HR (Objective Type Online Examination)
PR. TEE EXAM	: --
PT. EXAM	: 20 Min (Objective Type)

❖ RATIONALE:

Energy conservation is a scientific and basic tool to make balance in different forms of energies. This course imparts the awareness, knowledge and practical skills/ techniques of energy conservation in various sectors. To maintain the growth of development, electricity generation will be required to be increased by proper utilization of renewable and non-renewable sources of energy. After completion of this course diploma engineering students must use various techniques and methods of energy conservation. Also they should be able to perform energy audit and its implementation.

❖ COURSE OUTCOMES:

After completing this course students will be able to—

1. Identify role of different Government Bodies in energy conservation.
2. Suggest measures for energy conservation after energy audit.
3. Propose measures to conserve energy in mechanical systems.
4. Apply measures to conserve energy in electrical systems.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Introduction	1a. Estimate energy requirement in world and India per year. 1b. Justify need of Energy Conservation Act 2003. 1c. Identify role of given government bodies in energy conservation. 1d. Identify stars on given appliance. 1e. Identify type of given building as per ECBC.	1.1 Energy scenario: Energy Demand and Supply in world and India 1.2 Energy Conservation Act 2003 1.3 Roles of MNRE, MEDA, BEE 1.4 Star Labelling-Meaning, Purpose 1.5 Energy Conservation Building Codes-Purpose, Building Classification	06
2. Energy Audit	2a. Select suitable measuring instrument for given application. 2b. Calculate Pay Back Period for given system. 2c. Describe various steps in Energy Audit.	2.1 Energy audit , Energy audit instruments and their use, Questionnaire for energy audit projects, Energy flow diagram 2.2 Simple payback period meaning and simple calculation 2.3 Energy Audit procedure -walk through audit and detailed audit.	06
3. Energy Conservation in Mechanical Systems	3a. Summarize different factors on which performance of given pump depends. 3b. Assess opportunities for saving energy in given mechanical systems. 3c. Implement measures for saving energy in fans and blowers. 3d. Describe effect of different parameters on efficiency of given compressor.	3.1 Factors affecting pump performance, Efficient Pumping system operation, Energy conservation opportunities in Pumping systems 3.2 Fan types, flow control strategies, Fan performance Assessment, Energy ,Conservation opportunities in Pumping systems 3.3 Measures for energy saving in fans and blowers 3.4 Classification of Compressors, Pneumatic System components, Effect of various parameters on efficiency of Compressor	08
4. Energy Conservation in Electrical Systems	4a. Suggest different measures for conserving energy in given electrical appliances. 4b. Select suitable energy	4.1 Measures for Energy conservation in -Refrigerators -Air conditioners -Electric Furnace -TV, Computers -Geysers	12

	conservation in technique in given condition for a lighting system. 4c. Justify need of energy conservation in given transformers and induction motors. 4d. Describe advantages of Cogeneration on given points. 4e. Describe how energy can be conserved by using given tariff system.	4.2 Energy Conservation in Lighting by -Replacing Lamp sources -Using energy efficient luminaries -Using light-controlled gears -Installation of separate transformer / servo stabilizer for lighting -Periodic survey and adequate maintenance programs 4.3 Need for energy conservation in induction motor and transformer 4.4 Cogeneration-Meaning, Advantages 4.5 Tariffs for energy conservation	
		Total Hrs	32

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Nil

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction	01(00)	01(00)	01(01)	03(01)
2	Energy Audit	01(00)	03(00)	03(01)	07(01)
3	Energy Conservation in Mechanical Systems	01(00)	03(00)	04(01)	08(01)
4	Energy Conservation in Electrical Systems	02(00)	04(01)	06(01)	12(02)
	Total	05(00)	11(01)	14(04)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	U	1	1	A	1	1	A	1	2	R	1	30/35
	2	U	1	2	U	1	2	U	1	2	A	1	2	A	1	
	2	A	1	2	A	1	3	R	1	3	U	1	3	U	1	
	3	U	1	3	A	1	3	A	1	3	A	1	3	A	1	
	3	A	1	4	R	1	4	R	1	4	U	1	4	U	1	
	4	U	1	4	U	1	4	U	1	4	A	1	4	A	1	
	4	A	1	4	A	1	4	A	1	4	A	1	4	A	1	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assignments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

Nil

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	
	1	2	3	4	5	6	7	1	2	3
1	3				3		3			
2	3	3			3	2	3			
3	3	3			3		3			
4	3	3		3	3		3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Generation and Utilisation of Electrical Energy	D. Srilatha S. Sivnagraju M. Balasubbarreddy, Pearson, New Delhi 2010	8131798771, 9788131798775 978-81-317-6774-O
2	India – The Energy Sector	P.D. Henderson, World Bank Publication, Oxford University Press, 1975.	0-19-521598-2-
3	Energy Management Handbook	W.C Turner, John Wiley and Sons Wiley Press Eighth Edition, 2015	10: 142008870X
4	Efficient Use and Management of Electricity in Industry.	B.G. Desai, J.S. Rana, A.V. Dinesh, R. Paraman, Devki Energy Consultancy Pvt. Ltd, 4th Edition, 2016	-

❖ E-REFERENCES:

- <https://legislative.gov.in/sites/default/files/A2001-52.pdf> , accessed on 24 Dec 2021
- https://www.youtube.com/watch?v=d0Bh3TQ_oEU&ab_channel=ErgoELearning by Dr.Sonal Desai accessed on 24 Dec 2021
- https://www.youtube.com/watch?v=sB0foj6GTi8&ab_channel=AMOLPARKHE accessed on 24 Dec 2021
- https://www.youtube.com/watch?v=ZKUzm5vh3qc&ab_channel=J%C3%A4mtkraft AB accessed on 24 Dec 2021
- https://www.youtube.com/watch?v=lovqoSrQI_w&ab_channel=ClassgoEducation accessed on 24 Dec 2021

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:

Nil

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Mr.A.M.Arekar	HoD, Electrical Engg.Deptt.	Government Polytechnic, Nagpur
2	Dr.G.V.Gotmare	HoD, Electrical Engg. Deptt.	Government Polytechnic, Gondia
3	Mr.M.N.Gawande	Lecturer in Electrical Engg.	Government Polytechnic, Nagpur
4	Smt.A.A.Alegaonkar	Lecturer in Electrical Engg.	Government Polytechnic, Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)


GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN ME/CE/EE/PK/MT/TX/IT/CM / MC/AI/EC/TR
COURSE CATEGORY:	OPEN ELECTVIVE COURSE
COURSE CODE	: OE217G
COURSE TITLE	: ELECTRIC VEHICLES**
TEACHING SCHEME:	TH: 02; TU: 00; PR: 00 (CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 01 HR (Objective Type Online Examination)
PR. TEE	: --
PT.	: 20 Min (Objective Type)

❖ RATIONALE:

Automobile engineering technicians, being a professional who deals with a motor vehicle related activities during its life cycle should be thoroughly conversant with different Auto. Transmission system & all sub Systems associated. This is Advance Technology course that deals with construction and working of transmission system in general and its sub systems in particular that equip AET to deal with them satisfactorily. The course aims to impart basic skills and understanding of automobile transmission systems basic components their working principle, classification and performance characteristics.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply the knowledge of Electric vehicle system.
2. Select various EV layouts and different types of drives.
3. Identify the various systems of EV and their parts.
4. Disassemble & assemble the components of EV.
5. Service EV modern cars and bikes.
6. Diagnose faults in battery, gear boxes, differential and the wheels.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to Electrical Vehicles	1a. Define given term of EV. 1b. Describe given layout of EV. 1c. Describe various FEMA regulations.	1.1 Introduction: 1.1.1 Electric Vehicles - Need, Types – Cost and Emissions – End of life. 1.1.2 EV's general layout / differences compared to IC engine vehicles and Hybrids 1.1.3 FEMA Regulations.	04
2.EV Layout	2a. Describe the layout of given EV 2b. Classify different layouts in EV. 2c. State the Functions of given parts.	2.1 Two wheeler Electric Vehicle– layouts, cables, components and Controls and Functions of above parts. 2.2 Four wheeler Electric Vehicle – layouts, cables, components and Controls and Functions of above parts.	04
3. EV Motors and Drives	3a. Describe the construction and working of given motors used in EV. 3b. Classify EV motors on the given basis. 3c. Identify faults in EV electric motor based on symptoms and suggest remedy.	3.1 Electric Vehicle Motors – Motors (DC, Induction, BLDC) – Types, Principle, Construction, Control. 3.2 Electric Drive Trains (EDT) – Series HEDT (Electrical Coupling) – Power Rating 3.3 Design, Peak Power Source (PPS); Parallel HEDT (Mechanical Coupling) – Torque Coupling and Speed Coupling. 3.3.1 Switched Reluctance Motors (SRM) Drives – Basic structure, Drive Converter, Design 3.3.2 Parts of a typical hub mounted BLDC traction motor- Specifications construction, working and testing.	06
4. EV Motor Control Unit	4a. State the necessity of Motor control unit in given EV.	4.1 Traction Motor Controller : Basic Functionalities of Motor Control Unit	06

	4b. Identify components of High voltage circuit in given EV. 4c. Describe construction and working of the given EV motor inverter.	4.2 High voltage circuit in EV car and Low voltage Circuit in EV car, Multiple CAN network, Torque delivery, Launch control, On the fly power levels, DC-DC Converter, Power distribution modules. 4.3 Motor invertors – Need, construction, types, specifications and working and testing.	
5. EV Battery and Its Management System	5a. Describe Construction of given battery pack. 5b. Describe battery management system. 5c. Describe General recycling methods of recycling of EV batteries.	5.1 Battery Pack And Battery Management System 5.1.1 Selection of battery for EVs & HEVs, Traction Battery Pack design, 5.1.2 Requirement of Battery Monitoring, Battery State of Charge Estimation methods 5.1.3 Battery Cell equalization problem, 5.1.4 Energy storage system and management system 5.1.5 Battery thermal control, protection interface, SOC Estimation, Energy & Power estimation, 5.2 Parts: Power Module, Battery, DC/DC Converter, load, communication channel, 5.3 Battery Pack Safety and Battery Standards 5.3.1 Thermal Runway: High discharge rates, Short circuits, charging and discharging. 5.3.2 General recycling methods of recycling of EV batteries.	06
6. EV Charging	6a. State given Electric Vehicle supply system. 6b. Classify EV charging system pressure on given basis. 6c. Enlist EVSE Standards and their	6.1 Electric Vehicle Supply Equipment (EVSE) classification - Rapid fast charging, Battery swapping, Range extension (RE) systems and Wireless charging on following parameters : • By EVSE output - AC	06

	application.	or DC • By EVSE power rating – levels 1, 2, 3 • By charging speed – slow, fast or ultra-fast • By charging communication and connector type – CCS, GB/T, CHAdeMO 6.2 EVSE safety standards : IEC 61140, IEC 61000-6-2 AC charging and connectors: IEC-62196-2 (normal + high power), IEC 60309-1, SAE J 1772 (Type 1) etc DC Charging and Connectors: IEC-62196-3 (normal + high power), GB/T 20234.3- 2015	
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Electrical Vehicles	01(00)	01(00)	01(01)	03(01)
2	EV Layout	01(00)	03(00)	03(01)	07(01)
3	EV Motors and Drives	01(00)	03(00)	04(01)	08(01)
4	EV Motor Control Unit	02(00)	02(01)	02(01)	06(02)
5	EV Battery and its management System	00(00)	02(00)	02(00)	04(00)
6	EV Charging	00(00)	00(00)	02(00)	02(00)
	Total	05(00)	11(01)	14(04)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	U	1	1	A	1	1	A	1	2	R	1	30/35
	2	U	1	2	U	1	2	U	1	2	A	1	2	A	1	
	2	A	1	2	A	1	3	R	1	3	U	1	3	U	1	
	3	U	1	3	A	1	3	A	1	3	A	1	3	A	1	
	3	A	1	4	R	1	4	R	1	4	U	1	4	U	1	
	4	U	1	4	A	1	4	A	1	4	A	1	5	U	1	
	5	U	1	5	A	1	5	A	1	6	A	1	6	A	1	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	2	3	-	3	-	-	3	3	3
2	3	-	-	3	3	-	3	2	3
3	2	3	2	-	-	-	3	2	2
4	3	3	-	-	3	-	3	3	3
5	3	-	-	3	3	-	3	3	3
6	3	3	2	-	-	-	3	3	3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Electric Vehicles: Modern Technologies and Trends	Nil Patel, Akash Kumar Bhoi, Sanjeevikumar Padmanaban, Jens Bo Holm-Nielsen Springer Nature, 25-Nov-2020	97881801419669
2	Electric Cars: The Ultimate Guide for Understanding	Book by Brad Durant, Createspace Independent Pub, 31 May 2014	978-1507849774
3	Electric and hybrid vehicles: fundamentals design	Iqbal Husain, CRC Press, 16 August 2010	143981175X, 978-1439811757
4	Modern Electric, Hybrid Electric, and Fuel Cell Vehicles	Mehrdad Ehsani, Yimin Gao, Stefano Longo, Kambiz Ebrahimi, CRC Press, 28 March 2018	1498761771, 978-1498761772

❖ **E-REFERENCES:**

- <https://batteryuniversity.com>, dated 12 th February 2022
- <https://www.youtube.com/watch?v=3SAxXUIre28> 12 th February 2022
- <https://www.youtube.com/watch?v=tJfERzrG-D8> 12 th February 2022
- https://www.youtube.com/watch?v=j3-gbhi_nds 12 th February 2022

- ❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:
Nil

- ❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Dr.G.K.Awari	Head of Automobile Engineering	Government Polytechnic, Nagpur.
2	Mr.S.D.Thakre	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3	Dr.K.S.Dixit	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4	Mr.S.A.Telang	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.

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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/CE/EC/MC/ME/MT/PK/TX/TR/EE/CM
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE218G
COURSE TITLE	: ARTIFICIAL INTELLIGENCE**
TEACHING SCHEME	: TH:02;TU:00;PR:00(CLOCK Hrs.)
TOTALCREDITS	: 02(1TH/TUCREDIT=1CLOCK HR., 1 PR CREDIT=2 CLOCK HR.)
TH. TEE EXAM	: 01HR (Objective Type Online Examination)
PR. TEE EXAM	: --
PT. EXAM	: 20Min (Objective Type)

❖ RATIONALE:

This course will introduce and define the meaning of Intelligence and explore various paradigms for knowledge encoding in computer systems. The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. Develop a basic understanding of the building blocks of AI as presented in terms problem, problem space: Search, Knowledge representation, inference, logic, and learning.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify the need of AI and its applications in real life.
2. Analyze and illustrate how search algorithms play vital role in problem solving.
3. Analyze the different types of intelligent agents.
4. Build knowledge of reasoning and knowledge representation for solving real world problems.
5. Illustrate various types of learning of AI.
6. Analyze the expert system tools and applications.

❖ COURSE DETAILS:

A. THEORY:

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction	1a. Justify the given concepts of AI. 1b. Choose correct types of AI on the basis of given point. 1c. Compare AI with given topic with justification.	1.1 Definitions – Artificial Intelligence History of AI, Evolution of AI -Applications of AI 1.2 Meaning of intelligence, turning test, Intelligent Decision, Types of AI 1.3 Artificial Intelligence Vs Machine learning, Topics in AI	04
2. State Space Search	2a. Select suitable search technique on the basis of given point. 2b. Compare search method with given point. 2c. Compare heuristic search on basis of given point.	2.1 Generate and test, Simple search 2.2 Depth First search(DFS), Breadth First search(BFS) 2.3 Comparison of DFS and BFS, Quality of solution, Heuristic search	06
3. Intelligent Agents	3a. Identify the types of given intelligent agents. 3b. Justify need of AI with example.	3.1 Types of AI Agents, Agents in AI, Agents environment 3.2 Turning Tests in AI, Applications of AI-Artificial intelligence, Importance of AI	06
4. Knowledge Representation	4a. Describe issues and approaches related to given knowledge representation. 4b. Select appropriate knowledge representation technique to represent given fact.	4.1 Approaches to Knowledge representations, Issues in Knowledge representations , Frame Problem 4.2 Knowledge and Reasoning: Building a Knowledge Base: Propositional logic, first order Logic, situation calculus. Theorem Proving in First Order Logic, Planning, partial order planning	06
5. Subset of AI	5a. Classify types of learning on basis of given point. 5b. Compare given main two types of learning on basis of given point. 5c. Illustrate the concepts of given learning.	5.1 Meaning of learning, Types of learning-Narrow AI, strong AI, general AI, super AI machine learning, deep learning 5.2 Supervised and unsupervised learning, Robotics ,Machine vision, Speech Recognition	04

6. Expert System	6a. Justify need of given Expert system on basis of its given characteristics. 6b. Identify components of given expert system on basis of given point.	6.1 Introduction to Expert Systems- Need of expert system, Characteristics of expert system 6.2 Components of expert system, Limitations, Application: NLP(natural language processing)	06
		Total	32

B. LIST OF PRACTICALS /LABORATORY EXPERIENCES/ASSIGNMENTS:NIL

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction	01(00)	02(00)	01(00)	04(00)
2	State space search	01(00)	02(00)	02(01)	05(01)
3	Intelligent Agents	01(00)	02(00)	03(01)	06(01)
4	Knowledge Representation	02(00)	00(01)	03(00)	05(01)
5	Subsets of AI	00(00)	03(01)	03(00)	06(01)
6	Expert Systems	01(00)	00(00)	03(01)	04(01)
	Total	06(00)	09(02)	15(03)	30(05)

R– Remember

U– Understand

A–Analyze/Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

T-Unit/Topic Number

L-Level of Question

M-Marks

R-Remember

U-Understand

A-Analyze/Apply

1 R 2 means Unit/Topic Number No-1,Level of Question–Remember, Marks–2 Marks

Q. No	Bit1			Bit2			Bit3			Bit4			Bit5			Bit6			Options
Q.No.1 to Q.No.35	1	R	1	1	U	1	1	U	1	1	A	1	2	R	1	2	U	1	30/35
	2	U	1	2	A	1	2	A	1	2	A	1	3	R	1	3	U	1	
	3	U	1	3	A	1	3	A	1	3	A	1	3	A	1	4	R	1	
	4	R	1	4	A	1	4	A	1	4	A	1	4	U	1	5	U	1	
	5	U	1	5	U	1	5	A	1	5	A	1	5	A	1	5	U	1	
	6	R	1	6	A	1	6	A	1	6	A	1	6	A	1				

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:Nil**❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	-					3	--	-	-
2	3	-	-	-	-	-	3	-	-	-
3	3	-	-	-	-	-	3	-	-	-
4	3	-	-	-	-	-	3	-	-	-
5	3	--	-	-	-	-	3	-	-	-
6	3	-	-	-		-	3	-	-	-

1:Slight(Low) 2:Moderate(Medium) 3:Substantial(High)

❖ REFERENCE&TEXTBOOKS:

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Artificial Intelligence A Modern Approach	S.Russell and P.Norvig., Pearson Education, 4 th edition, 2020	13:978-0-13-604259-4
2	First Course in AI	Deepak Khemani, McGraw Hill, 2013	13:978-93-832-8678-2 10:93-832-8678-4
3	Artificial Intelligence	E. Rich and K. Knight and Shivashankar B.Nair., 3 rd edition, Tata McGraw Hill	13:978-007-008-770-5
4	Introduction to Artificial Intelligence & Expert Systems	Dan W.Patterson, PHI., 1990 Learning, 1st ed. 2011	9789332551947

❖ E-REFERENCES:

- <https://www.javatpoint.com/types-of-ai-agents>, accessed on 25 Jan. 2022
- http://www.dkriesel.com/en/science/neural_networks, accessed on 25 Jan. 2022
- https://www.youtube.com/results?search_query=artificial+intelligence, accessed on 25 Jan 2022
- <https://www.youtube.com/watch?v=s-s9ilkMVj8>, accessed on 25 Jan. 2022

❖ LIST OF MAJOR EQUIPMENTS / INSTRUMENTS WITH SPECIFICATION : Nil

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute/Industry
1	Dr.A.R.Mahajan	Head of Department (I.T.Dept.)	Chairman, Course Expert
2	Mr.Dipak Dhote	Operations Manager, IT-Network Infosystems Pvt LTD	Industry Expert
3	Dr.Rakesh Kadu	Assistant Professor, I.T., Ramdeobaba College of Engg, and Management, Nagpur.	Member from Academics(External)
4	Mrs.V.A.Raje	Lecturer in C.O., G.P.Arvi	MSBTE Nominee
5	Mr.L.D.Vilhekar	Lecturer in Information Tech.	Member(Internal)
6	Mrs.D.P.Chanmanwar	Lecturer in Information Tech.	Member(Internal))
7	Mr.M.N.Gawande	Lecturer in Electrical Engg.	CDC In Charge and Member Secretary
8	Mrs.Isha L.Sangolkar	Lecturer in Information Tech.	Course Expert

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AE/ME/CE/EC/MT/PK/EE/TX/AI/CM/IT/TR
COURSE CATEGORY: OPEN ELECTIVE COURSE
COURSE CODE : OE222G
COURSE TITLE : MECHATRONICS**
TEACHING SCHEME: TH:02; TU: 00;PR: 00(CLOCK HRs.)
TOTAL CREDITS : 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM : 01 HR (Objective Type Online Examination)
PR. TEE EXAM : --
PT. EXAM : 20 min Objective Type)

❖ RATIONALE:

Mechatronics is multi disciplinary field that focuses on the integration of mechanical, electronics and electrical engineering system. It includes a combination of robotics, electronics, computer science, telecommunications, control and product engineering. This subject develops skills in students about to produce a design solution that unifies each of these various subfields. A mechatronics engineer unites the principles of subfields to generate a simpler, more economical and reliable system.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Use various control systems for suitable applications.
2. Troubleshoot problems in various sensors and transducers.
3. Select a particular motor depending upon the system design requirements.
4. Develop a program to perform a task using different instructions in PLC.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to Mechatronics	1a. Use given mechatronics system. 1b. Describe given components of given system architecture. 1c. Classify given types of control system. 1d. Use application of given water level controller. 1e. Utilize controllers for given applications.	1.1 Introduction to Mechatronics, Importance of Mechatronics. 1.2 Mechatronics system architecture - Sensors, Signal conditioners, PLC/ Embedded controllers, Pneumatic, Hydraulic and electrical actuators. 1.3 Control systems – open and closed loop systems, Basic elements of Closed-loop control System. 1.4 Automatic water level controller. Sequential controllers-washing machine. 1.5 Advantages and disadvantages of Mechatronics.	06
2. Sensors and Transducers	2a. Describe functions of given sensors and transducers. 2b. Categorize given performance terminology. 2c. Describe troubleshooting procedure of given displacement sensors. 2d. Describe given sensors for suitable application. 2e. Select suitable temperature sensor for given application.	2.1 Introduction to Sensors and Transducers. Selection criteria of Sensors. 2.2 Performance terminology – Range and span, Error, Accuracy, Sensitivity, Hysteresis error, Repeatability. 2.3 Displacement sensors:- LVDT, RVDT. Position sensors:- Hall effect sensor, Eddy current . 2.4 Proximity sensors:- Capacitive and Inductive, Optical encoder, Force Sensors. 2.5 Temperature Sensors:- Thermocouple, RTD.	10
3. Actuation Systems	3a. Describe various components of given actuation system. 3b. Use given bearings for given application. 3c. Classify various components of given electrical actuation system. 3d. Select a particular	3.1 Mechanical Actuation Systems - Types of motion, Freedom and constraints, Loading, GearTrains, Pawl & Ratchet, Belt and Chain drives. 3.2 Bearings –Types of bearings and applications. 3.3 Electrical Actuation Systems - Switches & Relays, Solenoids, Introduction of D.C. Motors and	08

	motor depending upon the given system design requirements. 3e. Classify given types of servomotor. 3f. Maintain given systems on the basis of component faults.	A. C. Motors. 3.4 Stepper Motors - Specifications and Control of stepper motors. 3.5 Servomotors - D.C. Servomotor and A.C Servomotor. 3.6 Pneumatic & Hydraulic Systems - Power supplies, DCV, PCV, cylinders.	
4. Programmable Logic Controller (PLC)	4a. Describe structure of given system. 4b. Develop the given ladder logic for given instructions of PLC. 4c. Develop a program to perform a given task using different instructions in PLC. 4d. Use given components of PLC. 4e. Select appropriate PLC for given application.	4.1 Definition, Basic block diagram and structure of PLC, Input/Output processing. 4.2 Types of PLC Programming, Ladder diagram, its logic functions. 4.3 Latching and Sequencing, PLC mnemonics. 4.4 Timers, Internal relay and Counters, Shift registers, Master and Jump Controls. 4.5 Data handling, analog input/output, Selection of PLC.	08
		Total Hrs	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Mechatronics	01(00)	03(01)	03(00)	07(01)
2	Sensors and Transducers	01(00)	04(00)	03(01)	08(01)
3	Mechanical and Electrical Actuation Systems	01(00)	04(00)	03(01)	08(01)
4	Programmable Logic Controller (PLC)	01(00)	03(01)	03(01)	07(02)
	Total	04(00)	14(02)	12(03)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
Q. 01 To Q. 35	1	R	1	1	U	1	1	U	1	1	U	1	1	A	1	1	A	1	30/35
	2	R	1	1	U	1	1	A	1	2	U	1	2	U	1	2	U	1	
	3	R	1	2	U	1	2	A	1	2	A	1	2	A	1	2	A	1	
	4	R	1	3	U	1	3	U	1	3	U	1	3	U	1	3	A	1	
	3	A	1	3	A	1	3	A	1	4	U	1	4	U	1	4	U	1	
	4	U	1	4	A	1	4	A	1	4	A	1	4	A	1				

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1, 2, 3,4
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	--
		Journal Writing		Assignments	--	--	Journal	--
				Total	--	--		--
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		--	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	3	-	-	-	2	-
2	3	2	-	3	1	-	2	2	2
3	3	2	2	3	-	2	2	-	-
4	3	-	-	-	-	-	-	-	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Mechatronics	W. Bolton, Pearson Education, India, Fourth Edition, 2008	8131762572 9788131762578
2	Mechatronics (Integrated Mechanical Electronics System)	K.P. Ramchandran, G. K. Vijayraghavan, M.S. Balsundaram, Wiley India Pvt. Ltd., First Indian Edition, 2008	8126518375 9788126518371
3	Mechatronics : An Introduction	Robert Bishop, CRC press, 2008	0849363586
4	Mechatronics	J. Paulo Davim, Wiley India Pvt. Ltd. 2011	1848213085 9781848213081
5	Robotics	Appu Kuttan K. K., I. K. International Pvt. Ltd., First Edition, 2010	8189866389 9788189866389

❖ **E-REFERENCES:**

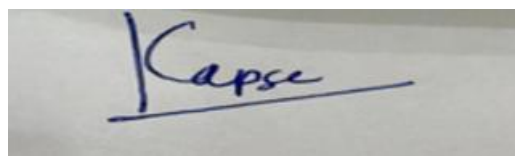
- A. nptel.ac.in/courses/112103174 , accessed on 30th August, 2021
 B. nptel.ac.in/courses/pdf/mod7 , accessed on 30th August, 2021
 C. video_demos.colostate.edu/mechatronics , accessed on 30th August, 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

Nil

❖ ❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**
~~LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS~~
CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Dr.R.V.Yenkar	Head of Electronics & Telecomm Engineering	Government Polytechnic, Nagpur
2	Dr.V.H.Mankar	Head of Electronics & Telecomm Engineering	Government Polytechnic, Nagpur.
3	Mrs.U.P.Potdar	Lecturer in Electronics & Telecomm Engineering	Government Polytechnic, Nagpur
4	Mrs.J.A.Raut	Lecturer in Electronics & Telecomm Engineering	Government Polytechnic, Nagpur
5	Mr.S.V.Darvhekar	Director	Beta Computronics Pvt. Ltd.Nagpur
6	Mrs.Gazala Ali	Head of Electronics & Telecomm Engineering,	Ajuman Polytechnic, Nagpur.
7	Mr.K.S.Pachpor	Lecturer in Electronics,	Government Polytechnic, Achalpur.



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURE
COURSE CATEGORY	: CORE COURSE
COURSE CODE	: TX251G
COURSE TITLE	: FABRIC STRUCTURE AND DESIGN
TEACHING SCHEME	: TH:01; TU: 00;PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 03 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HRs.)
TH. TEE EXAM	: NIL
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: NIL

❖ RATIONALE:

The quality of woven fabric depends on its functional and aesthetic properties. Diploma engineers should understand the fabric structure of different types of woven samples as well as the fabric analysis procedure. This course contains fundamental concepts and principles of fabric structure and hence study of this course is very important for students so that they can design and then understand how to produce fabric on a loom using appropriate techniques.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply basic concepts of fabric structures.
2. Draw given derivatives of plain weave.
3. Construct relevant derivatives of twill weave on graph sheet.
4. Analyze various designs of sateen weave by using different principles.
5. Prepare different design of colour and weave effect.
6. Develop fabric designs by using fancy structure.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Fundamentals of Fabric Structure	1.a Apply concept of interlacement for given fabric representation. 1.b Identify the relevant draft for the given design. 1.c Draw the draft and peg plan for the given design. 1.d Measure EPI/PPI and calculate the weight in GSM of the given fabric	1.1 Concept of interlacement of warp & weft. Method of fabric representation on point paper 1.2 Definition of weave/design, weave repeat, draft, denting order & lifting plan. 1.3 Types of drafts – Straight draft, Skip draft, pointed draft, sateen draft. 1.4 Fabric quality parameters-Material of warp & weft, warp count weft count, EPI & PPI, warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.m.	02
2. Plain weave and its derivatives	2.a Draw the design, draft ,peg plan and cross section for the given weave 2.b Identify the derivatives of given plain weaves 2.c Prepare the ornamentation of plain weave by using given ornamentation techniques 2.d Differentiate quality parameters of given fabrics	2.1 Construction of plain woven fabrics - Design, draft, lifting plan cross-sectional view & denting order. Characteristic features of plain woven fabric. 2.2 Derivatives of plain weaves - Warp Rib weaves ,Weft Rib weaves , Hopsack, Mat or Basket weaves 2.3 Ornamentation of Plain weave - by changing colour, count, twist direction, twist level. 2.4 Quality particulars of Standard plain woven fabrics: Poplin, Voile, Cambric, Chiffon, Dhoti	02
3 Twill weave and its derivatives	3.a Draw the design of twill weave by using the given weave repeat 3.b Construct given twill based weaves with draft , peg-plan and cross-sectional view 3.c Describe the quality parameters of given twill weave fabrics	3.1 Classification of basic twills, Characteristic features of twill woven fabric. Balanced & unbalanced twill-Design, draft, denting order & lifting plan with cross-section view. 3.2 Weaves Constructed on Twill Bases - Design, draft, denting order & lifting plan of following twills (a) Pointed twill (b) Waved twill (c) Broken twill (d) Herringbone twill (e) Transposed or Re arranged twill (f) Curved twill (g) Elongated twill (h) Combinations of twill weaves 3.3 Quality particulars of Standard Twill Woven Fabrics: Denim, drill.	04

4. Satin/Sateen weaves and its derivatives.	4.a Analyze given satin and sateen weaves 4.b Draw the given types of satin and sateen weaves 4.c Select the suitable move numbers for the given weave repeat to construct given weave.	4.1 Characteristic feature of satin & sateen woven fabrics. Concept of move number for development of satin & sateen structure. 4.2 Development of regular satin & sateen weave and their Draft, denting order & lifting plan 4.3 Development of irregular satin & sateen weave and their Draft, denting order & lifting plan	02
5. Colour & Weave effect	5.a Apply principle of colour and weave effect for given pattern 5.b Prepare the colour and weave effect with given specification 5.c Differentiate weaves with given colour patterns	5.1 Concept of colour & weave in combination. Classifications of colour & weave effect 5.2 Representation of colour & weave effect on design paper. Examples of simple colour & weave effect 5.3 a) Continuous line effect b) Hound's tooth patterns c) Bird's eye & spot effects	02
6. Fancy Fabric Structures.	6.a Develop the design, draft and peg plan of given fancy weave on point paper. 6.b Develop given types of Honey comb weaves 6.c Draw Huck-a-back structures for the given weave repeat 6.d Draw Mock-leno structures for the given weave repeat	6.1 Development of Crepe weaves 6.2 Development of Honey-comb structures. a) Ordinary Honey-comb structures. b) Brighton Honey-comb structures. 6.3 Development of Huck-a-Back Structure 6.4 Development of Mock- Leno structures. 6.5 Introduction to Textile CAD & its application	04
Total Hrs.			16

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Use counting Glass to i) Identify warp & weft direction in given sample ii) Identify interlacement of warp & weft iii) Measure Ends/inch & Picks/inch	Fundamentals of Fabric Structure	04
2	Use analysis tool kit to i) Identify face and back side of the fabric ii) Identify the selvage of given fabric iii) Check the finished of fabric iv) Measure the dimensions such as length, the width of fabric randomly at various points (select at least five observations), and report the average		04
3	Prepare graphical representation of weave/design, weave repeat, draft & lifting plan on point paper.		04
4	Use analysis tool kit to analyse given plain weave	Plain weave and its	02

	fabric sample to i) Estimate warp count, weft count ,EPI & PPI, twist direction and crimp % ii) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of iii) Represent the design, draft and pegplan on point paper	derivatives	
5	Use analysis tool kit to analyse given warp rib/weft rib weave fabric sample to i) Estimate warp count, weft count ,EPI & PPI, twist direction and crimp % ii) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of iii) Represent the design, draft and pegplan on point paper		02
6	Use analysis tool kit to analyse given Hopsack/Mat weave fabric sample to i) Estimate warp count, weft count ,EPI & PPI, twist direction and crimp % ii) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of iii) Represent the design, draft and pegplan on point paper		04
7	Use sample loom to develop Plain weave and note i) EPI and PPI ii) Warp and weft colour pattern		06
8	Use analysis tool kit to analyse given basic Twill weave fabric sample to i) Estimate warp count, weft count ,EPI & PPI, twist direction and crimp % ii) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of iii) Represent the design, draft and pegplan on point paper	Twill weave and its derivatives	04
9	Use analysis tool kit to analyse given derivative of Twill weave fabric sample to i) Estimate warp count, weft count ,EPI & PPI, twist direction and crimp % ii) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of iii) Represent the design, draft and pegplan on point paper		04
10	Use sample loom to develop Twill weave and note i) EPI and PPI ii) Warp and weft colour pattern		06
11	Use analysis tool kit to analyse given Satin/Sateen weave fabric sample to i) Estimate warp count, weft count ,EPI & PPI, twist direction and crimp % ii) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of iii) Represent the design, draft and pegplan on point paper	Satin/Sateen weaves and its derivatives	06
12	Use analysis tool kit to analyse given colour & weave effect fabric sample to	Colour& Weave	6

	i) Estimate warp count, weft count ,EPI & PPI, twist direction and crimp % ii) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of iii) Represent the design, draft and pegplan on point paper	effect	
13	Use analysis tool kit to analyse given Honeycomb/Crepe weave fabric sample to i) Estimate warp count, weft count ,EPI & PPI, twist direction and crimp % ii) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of iii) Represent the design, draft and pegplan on point paper	Fancy Fabric Structures	6
14	Use analysis tool kit to analyse given Huckaback/ Mock-Leno weave fabric sample to i) Estimate warp count, weft count ,EPI & PPI, twist direction and crimp % ii) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of iii) Represent the design, draft and pegplan on point paper		6
Total Hrs			64

C: SPECIFICATION TABLE FOR THEORY PAPER: NIL

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER : NIL**

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	-	-	-	-
		Class Room Assignments		Assignments	-	-	-	-
	TEE (Term End Examination)	End Exam	Students	End of the Course	-	-	-	-
				Total	-	-		
Direct Assessment & Practical (Continuous Assessment)	Continuous Assessment of Practicals		Students	End of Every Practical	20	--	Jobs and Assessment sheet	1, 2, 3,4,5,6

		Journal Writing		Assignment	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Job and Assessment sheet	1,2,3,4,5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Draw design, draft and peg plan.	20
2	Fabric Analysis	10
3	Fabric calculation (GSM and Cover factor)	10
4	Viva voce	10
	Total	50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COS)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	PSO1	PSO1
1	3	-	3	3	-	-	3	3	-
2	3	-	3	3	-	-	3	3	-
3	3	-	3	3	-	-	3	3	-
4	3	-	3	3	-	-	3	3	-
5	3	-	3	3	-	-	3	3	-
6	3	-	3	3	-	-	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Woven Cloth Construction	<i>A. T. C. Robinson R Marks, Textile Institute Manchester, 1967</i>	9781489958556
2	Watson's Textile Design and Colour: Elementary Weaves and Figured Fabrics. 7th ed.	<i>Watson, William Grosicki, Z. J</i> Published by Newnes Butterworths, 1979	10: 0408705159 / 9780408705158
3	Watson's Advanced Textile Design	Z. J. Grosicki, Woodhead Publishing	9781855739963/
4	Grammar of Textile Design	H. Nisbet, Abhishek Publisher,	9788182475144
5	Weaving : Conversion of yarns to Fabric	Lord P R and Mohamed M H	9781855734838

❖ **E-REFERENCES:**

- ❖ <https://www.youtube.com/watch?v=RMXgNrSRVfM> accessed on 5th February 2022
- ❖ <https://www.youtube.com/watch?v=yEZmttAy2c> accessed on 5th February 2022
- ❖ <https://www.youtube.com/watch?v=qD6bKAhlDul> accessed on 5th February 2022
- ❖ <https://nptel.ac.in/content/storage2/courses/116102005/download/mcqm7.htm> accessed on 5th February 2022
- ❖ <https://www.slideshare.net/txrockers/fabric-structureanddesign-15667875> accessed on 5th February 2022
- ❖ <https://nptel.ac.in/courses/116/102/116102005/> accessed on 5th February 2022

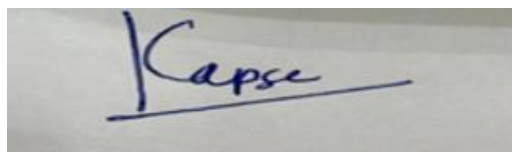
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

- 1 Hand loom for sample preparation
- 2 Pick counting glass
- 3 Pick glass to find out EPI, PPI, twist direction and type of weaves
- 4 Beesley balance
- 5 Electronic balance
- 6 Counting lens
- 7 Cutting template
- 8 Scissors
- 9 Measuring scales
- 10 Educational videos/animation films on preparation of different fabric structures
- 11 Fabric Analysis sheets
- 12 Fabric samples of different weaves

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	Head of Textile Department	Government Polytechnic, Nagpur.
2.	Dr.S.G.Gaikwad	Lecturer Textile	Government Polytechnic Nagpur

		Engineering	
3.	Mrs. L. S. Chakraborty	Lecturer in Textile Engineering	Government Polytechnic, Nagpur.
4.	Prof.S.S.Lawand	Lecturer in Textile Engineering	Government Polytechnic, Solhapur
5	Prof. G.S. Kakad	Head of Textile Department	JDIT, Yavatmal
6	Mr. R.N.Yadav	President	RSR Mohota Spinning and Weaving Mill



(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
LEVEL NAME	: PROGRAM CORE COURSE
COURSE CODE	: TX208G^s
COURSE TITLE	: ROVING AND YARN FORMATION
TEACHING SCHEME	: TH: 03;TU:00;PR:02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2CLOCK HRs.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Ring Frame and Speed frame together account for sixty percent of the total yarn conversion cost, productivity and quality. It accounts for 80% of the share of the staple yarn production. A fundamental and detailed understanding of the operations involved in creation of yarn is of crucial importance. The object of this course is to have a thorough understanding of the detailed operations involved in these processes so as to maintain machine to produce desired quality of yarn.

❖ **COURSE OUTCOMES:**

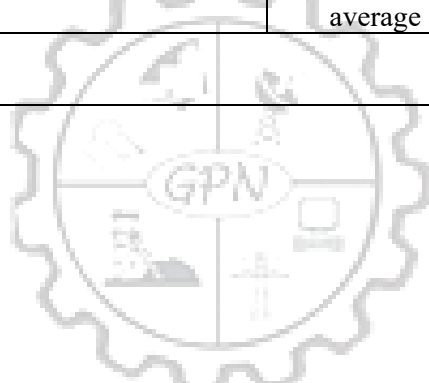
After completing this course students will be able to–

1. Justify the need of speed frame for spun yarn process.
2. Illustrate the different principles of speed frame.
3. Elaborate the functions of operating zones of ring frame.
4. Apply the principle of cop building mechanism on ring frame.
5. Select twist direction, twist and yarn properties for double yarn.
6. Calculate production, average count of doubled yarns.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1 Speed frame- Drafting and twisting	1a. Justify the need of speed frame for spun yarn process. 1b. Identify functions of given parts of speed frame.	1.1 Introduction (a) Objects of speed frame (b) Passage of material through speed frame. 1.2 Operating zones of speed frame: (a) Creel (b) Drafting system: Description, top and bottom rollers, aprons, spacers, cradles, weighting system, roving guide, condensers, effects of arrangement of bobbins in two rows (c) Twisting: spindle, types of flyers, description of flyer, false twister, flyer and spindle drive	08
2 Speed frame- Roving winding and calculations	2a. Illustrate the given principle of speed frame. 2b. Calculate twist, draft, production and efficiency of speed frame with the given data.	2.1 Winding: (a) Principle of package building on speed frame, (b) Bobbin drive, principle of spindle leading and bobbin leading, swinging joint/cradan shaft/ telescopic shaft/chain drive to bobbin rail, (c) Study of bobbin building mechanism, differential drive and cone drum drive, (d) Gear change places of speed frame. (e) Package and roving defects produced. 2.2 (a) Roving twist and draft calculations and its relationship to roving linear density, production and efficiency calculations.	12
3. Ring frame- Drafting and twisting	3a. Describe the passage of material through the given ring frame machine. 3b. Elaborate the functions of given operating zones of ring frame machine.	3.1 Introduction: (a) Objects of ring frame, (b) Passage of material through ring frame. 3.2 Operating zones of ring frame: (a) Creel (b) Drafting arrangements and its detail study (Top Arm Drafting system) (c) Spindles, (d) Thread guides; moving lappets, separators, balloon control rings, (e) Travellers (f) Rings (e) Spinning geometry.	12
4. Ring frame- Package formation and	4a. Apply the principle of given cop building mechanism. 4b. Enumerate changes on ring frame machine to suite given	4.1 Principle of cop building mechanism on ring frame. 4.2 (a) Yarn tension variation throughout cop build, variable speed drive to control end	08

calculations	type of materials. 4c. Calculate the twist, draft, production and efficiency with the given data.	breaks, yarn package faults. (b) Gear change places of ring frame to suit various counts. © Pneumafil suction, overhead traveller clearer. 4.3 (a) Yarn twist, traveller and spindle speed, count and draft calculations, twist multipliers for various types of cotton yarns. (b) Production and efficiency calculations.	
5. Ring doubling and twisting	5a. Describe the passage of material through the given doubling machine. 5b. Select twist direction, twist and yarn properties for given double yarn.	5.1 Objects of yarn doubling, passage of material through of Ring doubler. 5.2 Effect of direction and amount of twist in doubling for desirable doubled yarn properties such as strength, balance, lustre etc.	04
6. TFO and Fancy yarns	6a. Compare principle and working of given type of doubler. 6b. Calculate production, average count of given doubled yarns.	6.1(a) Principle and working of Two For One (TFO) twister and Fancy doubler (b) Introductory aspects of Voile yarn, sewing threads, and Fancy yarns. 6.2 Calculations of production, twist, average and resultant count.	04
Total			48



B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Draw passage of material through speed frame.	Speed frame-Drafting and twisting	02
2	Determine draft, spindle speed and TP from the machine gearing plan.		04
3	Draw bobbin building mechanism.	Speed frame-Roving winding and calculations	02
4	Determine bobbin speed, bobbin rail traverse speed, coils per inch from gearing diagram and locate change places on speed frame.		04
5	Observe and draw the passage of material through ring frame and label the parts.	Ring frame-Drafting and twisting	02
6	Observe and draw Top Arm drafting System, spindle, bolster, lappet guide, balloon control rings, separator, ring, and traveller.		02
7	Determine drafts, draft constant, spindle speed from draft gearing plan on ring frame.		02
8	Observe and draw building mechanism on ring frame to build ring bobbin.	Ring frame-Package formation and calculations	02
9	Calculate production of ring frame.		02
10	Locate change places on ring frame gearing diagram and passage of material.		02
11	Demonstrate the passage of material through ring doubler machine.	Ring doubling and twisting	04
12	Draw the passage of material through TFO.	TFO and Fancy yarns	02
13	Draw threading diagrams and observe parameters to produce fancy yarns.		02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit no	Units	Levels from cognition process dimension			Total marks
		R	U	A	
01	Speed frame-Drafting and twisting	02(02)	06(03)	03(00)	11(05)
02	Speed frame-Drafting and twisting	02(02)	06(03)	06(03)	14(08)
03	Ring frame-Drafting and twisting	02(02)	06(03)	06(06)	15(11)
04	Ring frame-Package formation and calculations	02(00)	06(00)	03(06)	11(06)
05	Ring doubling and twisting	02(00)	00(03)	03(00)	05(03)
06	TFO and Fancy yarns	02(00)	00(03)	03(00)	05(03)
	Total	12(06)	24(15)	24(15)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	1	U	3	2	U	3	1	U	3	2	U	3				3/5
03	2	U	3	3	U	3	3	U	3	3	U	3	2	A	3				3/5
04	4	U	3	4	U	3	1	A	3	5	U	3	6	U	3				3/5
05	4	A	3	5	A	3	6	A	3	3	A	3	3	A	3				3/5
06	2	A	6	3	A	6	4	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Practical Answer Sheets	1, 2, 3,4,5,6
		Journal Writing		Journal Writing	05	--	Journal	1, 2, 3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Sheets	1, 2, 3, 4, 5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Procedure	10
2	Process analysis	20
3	Calculation and interpretation of the result	10
4	Viva voce	10
	TOTAL	50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO1	PSO2
1	3	2		3	3		3	3	3
2	3	-	-	3	-	-	3	3	-
3	3	-	-	3	3	-	3	3	3
4	3	-	-	3	-	-	3	3	-
5	3	-	-	3	3	-	3	3	3
6	3	2	-	3	-	-	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Introduction to Textile Fibres	H V S Murthy , The Textile Association, India, 1986	
2	Technology of Short Staple Spinning- Vol. 1	W. Klein, The Textile Institute Manchester, 1986	0 900739 91 6
3	Spinning Preparation – Vol. 3	W. Klein, The Textile Institute Manchester	13-978-3-9523173-3-4
4	Ring Spinning – Vol. 4	W. Klein, The Textile Institute Manchester	13-978-95231173-5-8
5	Textile Yarns, Technology, Structure and Applications	B C Goswami, J G Martindale, F L Scardino, Mahajan Book Distributors, Ahmadabad Ed 1977	81-85401-04-07
6	Spun Yarn Technology	Eric Oxtoby, Butterworth an Co. Ltd, London, 1987	0-408-01464-4

❖ E-REFERENCES:

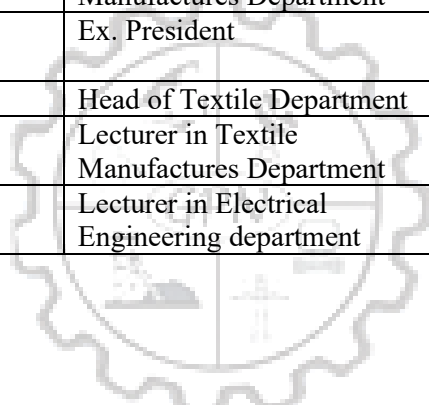
- <http://nptel.ac.in/courses/116102038/8> accessed on 20th February, 2022
- <http://nptel.ac.in/courses/116102038/16> accessed on 20th February, 2022
- <http://www.rieter.com/cz/rikipedia/articles/ring-spinning/function-and-mode-of-operation/operating-principle/> accessed on 20th February, 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Textile Laboratory –Speed frame, Ring frame, Ring doubler, TFO machine, tools and gauges.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	Head of Textile Manufactures Department	Government Polytechnic, Nagpur.
2.	Dr. S.G.Gaikwad	Lecturer in Textile Manufactures Department	Government Polytechnic, Nagpur.
3.	Mrs. L. S. Chakraborty	Lecturer in Textile Manufactures Department	Government Polytechnic, Nagpur
4.	Dr. S. B. Muttagi	Ex. Lecturer in Textile Manufactures Department	Government Polytechnic, Nagpur
5.	Mr. R. N. Yadav.	Ex. President	Mohota Spg and Wvg Mill, Hinganghat, Wardha
6.	Dr. G. S. Kakad	Head of Textile Department	JDIET, Yavatmal
7.	Mr. S. S. Lawand	Lecturer in Textile Manufactures Department	Government Polytechnic, Solhapur
8.	Mr.M.N.Gawande	Lecturer in Electrical Engineering department	Government Polytechnic, Nagpur



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
LEVEL NAME	: CORE COURSE
COURSE CODE	: TX209G^s
COURSE TITLE	: DOBBY, JACQUARD AND AUTO LOOM
TEACHING SCHEME	: TH: 03; TU:00; PR:02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2CLOCK HRs.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

This is the most important part of the fabric forming process which produces fancy designs by using different dobby and jacquard mechanism. Society requires large quantity and quality with different designs of fabrics. Power looms are not the solution, engineering and technological changes have brought about automation in weaving looms to increase production rates, different designs and quality of fabrics. This course imparts knowledge and skills to the diploma students in automatic looms and dobby, jacquard and drop box devices.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Choose the type of dobby to weave a fabric.
2. Select jacquard type to weave a designed fabric.
3. Describe the features of automatic loom.
4. Identify the functions of different motions on automatic loom.
5. Draw the let off motions of automatic loom.
6. Prepare the process flow chart for blended and voile yarn.

❖ COURSE DETAILS:

A. THEORY:

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Dobby shedding device	1a. Draw construction and write working of given dobbie type. 1b. Choose pegging methods For a given design. 1c Identify the need of dobbie pick finding device.	1.1 Scope and classification of dobbie. Construction & Working of following dobbies. a. Climax Dobby b. Cross border dobbie. c. Cam Dobby d. Paper Dobby e. Rotary dobbie. 1.2 Concept of pegging lags for right and left-hand dobbie. 1.3 Need of dobbie pick finding devices	09
2. Jacquard shedding device	2a. Identify type of jacquard. 2b. Draw and describe construction of given jacquard. 2c. Prepare the jacquard card lattice for given design. 2d. Select the type of a harness tie for given weave.	2.1 Scope of jacquard shedding & Classification of Jacquards 2.2 Construction & Working of - a. Single lift single cylinder jacquard b. Double lift single cylinder jacquard c. Double lift Double cylinder jacquard d. Cross border jacquard e Electronic jacquard. 2.3 Importance of card cutting and lacing. 2.4 Types of Harness ties - Straight tie ,Cross tie, Repeating tie, Center tie, Border tie, Combination tie	09
3. Warp preparation for Automatic loom	3a. Identify the process parameter for given machine. 3b. Describe the features of given type of loom.	3.1 Preparation of warp for efficient automatic weaving. 3.2 Types of Automatic looms, Features of automatic looms, Comparisons of Automatic looms & non-automatic looms.	06
4. Weft Changing mechanism	4a. Identify the functions of given type of motion 4b. Draw construction and write working of given weft changing motion. 4c. Elaborate the given box motion.	4.1 Automatic weaving concept and requirements. Types of weft feelers and their working-Mechanical (Midget), Electrical (Two-pronged feeler), Photo electrical 4.2 Study of construction and working of pirn changing motion and shuttle changing automatic motion 4.3 Multiple box automatic loom- advantages of multiple box motion, pick at will motion	08
5. Automatic loom	5a. Draw and describe the given type of warp stop motion. 5b. Describe the working of given positive let-off motion. 5c. Identify the need of center weft fork and center	5.1 Study of diff. type of warp stop motions used on automatic looms. a) Mechanical warp stop motion b) Electrical warp stop motion 5.2 Demerits of negative friction let- off. Construction and working of positive let off mechanism- Ruti, Roper and	08

	selvedge motion.	Hunts 5.3 Study of centre weft fork and centre selvedge motions	
6. Weaving of Different types of yarns	6a. Prepare a process flow chart for given blended and filament yarns. 6b. Identify the process parameters for given type of blended yarn.	6.1 Yarn properties of a. Polyester cotton blend b Polyester viscose blend c Polyester wool blend. Process flow chart for blended and filament yarns 6.2 Weaving of polyester blends, man-made filament, silk with special reference to preparatory and loom-type, speeds, setting etc. Voile/high twist yarn weaving.	08
Total			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Draw and describe the working of given type of dobby.	Dobby shedding device	04
2	Prepare card chain for given weft pattern for right- and left-hand dobby (Methods of pegging)		02
3	Draw and describe the working of given type of jacquard.	Jacquard shedding device	04
4	Observe card cutting and lacing and Prepare card chain for given weft pattern.		02
5	Prepare a process plan of a given warp for efficient weaving.	Warp preparation for Automatic loom	02
6	Draw and describe the working of given type of weft feelers.	Weft Changing mechanism	02
7	Draw and describe the working of given type of weft changing motion.		04
8	Draw and describe the working of given type of warp stop motion.	Automatic loom	02
9	Draw and describe the working of given type of positive let-off motion.		04
10	Prepare a process flow chart for given blended yarns.	Weaving of Different types of yarns	02
11	Prepare a process flow chart of weaving for given filament yarn.		02
12	Prepare a process flow chart of weaving for voile / high twist yarn.		02

❖SPECIFICATION TABLE FOR THEORY PAPER:

R – Remember U – Understand A – Analyze / Apply

❖QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	2	R	2	3	R	2	5	R	2										
02	1	U	3	2	U	3	2	U	3	1	U	3	1	U	3				3/5
03	3	U	3	4	U	3	5	U	3	4	U	3	5	U	3				3/5
04	6	U	3	2	A	3	3	A	3	6	U	3	1	A	3				3/5
05	4	A	3	6	A	3	6	A	3	4	A	3	6	A	3				3/5
06	1	A	6	5	A	6	2	A	6										2/3

T= Unit/Topic Number L= Level of Question M= Marks

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Dobby shedding device	02(00)	03(06)	06(03)	11(09)
02	Jacquard shedding device	02(02)	06(00)	03(06)	11(08)
03	Warp preparation for Automatic loom	02(02)	03(00)	03(00)	08(02)
04	Weft changing mechanism	02(00)	03(03)	03(03)	08(06)
05	Automatic loom	02(02)	03(03)	06(00)	11(05)
06	Weaving of Different types of yarns	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	21(15)	27(15)	60 (36)

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	After each practical	20	--	Practical Answer Sheets	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Sheets	1, 2, 3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Procedure	10
2	Process analysis	20
3	Calculation and interpretation of the Result	10
4	Viva voce	10
	TOTAL	50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	3	-	3	3	-	3	3	3
CO2	3	3	-	3	3	-	3	3	3
CO3	3	-	-	-	-	-	3	3	3
CO4	3	-	-	3	-	-	3	3	3
CO5	3	3	-	3	-	-	3	3	-
CO6	3	-	-	3	3	-	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Weaving machine, material & management	Talukdar, Sriramulu & Ajgaonakar Mahajan Publishers Private Limited, Ahmedabad	
2	Woven Fabric Production – I	NCTUE 2002	
3	Woven Fabric Production - II	NCTUE 2002	
4	Principles of Weaving	R. Marks & A.T.C. Robinson The Textile Institute Manchester	
5	Fancy Weaving Mechanism	Prof.K.T.Aswani Mahajan Publishers Private Limited, Ahmedabad	

❖ **E-REFERENCES:**

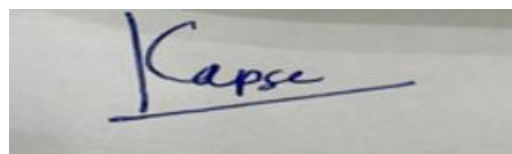
1. <https://www.textiletutorials.com/> assessed on 10th March 2022
2. <https://www.slideshare.net/> assessed on 10th March 2022
3. <https://textilelearner.net/dobby-shedding-mechanism/> assessed on 10th March 2022
4. <https://www.textilesphere.com/2020/12/dobby-shedding-mechanism-weaving.html> assessed on 10th March 2022
5. <https://www.fibre2fashion.com/industry-article/5196/filament-weaving> assessed on 10th March 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Textile Laboratory –Dobby loom, Jacquard loom, Drop box loom and Automatic loom

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	Head of Textile Department	Government Polytechnic, Nagpur.
2.	Mr. S. G. Gaikwad	Lecturer in Textile Manufactures	Government Polytechnic, Nagpur.
3.	Mrs. L. S. Chakraborty	Lecturer in Textile Manufactures	Government Polytechnic, Nagpur
4.	Mrs S.S.Bhatkule	Visiting Faculty in Textile Manufactures	Government Polytechnic, Nagpur
5.	Mr. R. N. Yadav.	President	Mohota Spg and Wvg Mill, Hinganghat, Wardha
6.	Prof. G. S. Kakad	Head of Textile Department	JDIET, Yavatmal
7.	Prof. S.S.Lawand	Lecturer in Textile Manufactures	Government Polytechnic, Solhapur



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
COURSE CATEGORY	: PROGRAM CORE COURSE
COURSE CODE	: TX210G^s
COURSE TITLE	: DYEING AND PRINTING
TEACHING SCHEME	: TH:03; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HRs.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Textile Manufactures students should know the process of dyeing and printing of textile goods. This course describes the different techniques of dyeing and printing textile substrates with different types of dyes. The knowledge and skills related to dyeing and printing of textile fibres is essential for the diploma engineer to create quality textile. And solve broad based problems in textile industry.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Justify type of dyeing machine for textile material.
2. Choose the after treatment to improve fastness properties of dyes.
3. Select dye and dyeing cycle for dyeing textile substrate.
4. Select relevant thickener and ingredients for printing the fabric.
5. Describe with sketch the given method of printing.
6. Apply appropriate after treatment to the given printed fabric

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Dyes and Dyeing machines	1a. Enlist the given terms in dyeing. 1b. Compare natural and synthetic dyes on given parameters. 1c. Justify type of dyeing machine for given material.	1.1 Classification of Dyes, Common terms used in dyeing, dyeing assistants, Mechanism of dyeing, 1.2 Introduction to Natural dyes, Eco friendly dyes, comparison between natural dyes with synthetic dyes 1.3 Dyeing machinery: Construction and working of Jigger, Winch, HTHP beam, package dyeing and continuous dyeing machine.	06
2. Dyeing of cellulosic fibres	2a. Describe the dyeing cycle and procedure of dyeing cellulosic material with given dye. 2b. Choose the after treatment to improve fastness properties of given dye.	2.1 Dyes for cellulosic material- Direct Dyes, Reactive dyes, Vat Dyes and Azo dyes: Properties, types, parameters affecting dyeing quality, Dyeing cycle, dyeing procedure. 2.2 Fastness properties of dyes, After treatments to improve the washing fastness, faults in dyeing.	10
3. Dyeing of protein and synthetic fibres	3a. Select dye and dyeing cycle for dyeing the given fabric. 3b. Choose the after treatment to improve fastness properties of given dye.	3.1 Dyes for different Textile substrates- Acid dyes—Wool and nylon Basic dyes- Silk Disperse dyes- Polyester Cationic dyes – Acrylic Properties, types, parameters affecting dyeing quality, Dyeing cycle, dyeing procedure. 3.2 Fastness properties of dyes, After treatments to improve the washing fastness, faults in dyeing.	10
4. Printing and printing paste	4a. Distinguish dyeing with printing on given parameters. 4b. Select relevant thickener and other ingredients for given dye/ textile substrate.	4.1 Objects of printing, difference between dyeing and printing, preparation of printing paste, sequence of printing. 4.2 Classification of thickeners, rheological behaviors of thickener and other ingredients in printing paste.	06
5. Styles and methods of Printing	5a. Choose the given style of printing for given dyes. 5b. Describe with sketch the given method of printing.	5.1 Styles of printing- Direct, Discharge and Resist 5.2 Methods of printing- roller, flat bed screen, rotary screen and transfer printing.	08

6. Printing procedures	6a. Select the print recipe for given dye and given textile material. 6b. Apply appropriate after treatment to the given printed fabric.	6.1 Printing procedure of cotton, viscose rayon, silk, wool, polyester, nylon and acrylic fabrics. 6.2 After treatment of printed fabrics- Ager, steamer and curer.	08
Total Hrs.			48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Use pretreated samples from various stages to dye with given natural dye.	Dyes and Dyeing machines	02
2	Use dyeing machine to dye the given cotton fabric with direct dye.		02
3	Use cold brand reactive dye to dye given viscose material.	Dyeing of cellulosic fibres	02
4	Use vat dye to dye the cellulosic material.		02
5	Apply after treatment to improve the fastness property of given direct dyes.		02
6	Use acid dye to dye given woolen fabric.	Dyeing of protein and synthetic fibres	02
7	Use basic dye to dye given silk fabric.		02
8	Use dye for dyeing and printing given cotton fabric and then compare dyeing with printing.	Printing and printing paste	02
9	Prepare printing paste for given textile material and write the functions of each ingredient.		02
10	Prepare printing paste and print given fabric with direct style of printing.	Styles and methods of Printing	02
11	Prepare printing paste and print given fabric with discharge style of printing		04
12	Prepare printing paste and print given fabric with resist style of printing		02
13	Apply screen print / block print on given material.		02
14	Prepare printing paste to print given textile material.	Printing procedures	02
15	Develop print on given fabric by curing or ageing		02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Dyes and Dyeing machines	02(00)	03(03)	03(00)	08(03)
02	Dyeing of cellulosic fibres	02(02)	03(03)	06(03)	11(08)
03	Dyeing of protein and synthetic fibres	02(02)	03(00)	06(06)	11(08)
04	Printing and printing paste	02(00)	06(06)	00(00)	08(06)
05	Styles and methods of Printing	02(00)	03(00)	06(06)	11(06)
06	Printing procedures	02(02)	06(03)	03(00)	11(05)
	Total	12(06)	24(15)	24 (15)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	2	R	2	3	R	2	6	R	2										
02	1	U	3	2	U	3	3	U	3	1	U	3	2	U	3				3/5
03	4	U	3	4	U	3	5	U	3	4	U	3	4	U	3				3/5
04	6	U	3	6	U	3	1	A	3	2	A	3	6	U	3				3/5
05	3	A	3	3	A	3	6	A	3	5	A	3	5	A	3				3/5
06	2	A	6	5	A	6	3	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Who m	Frequenc y	Max Mark s	Min Mark s	Evidence Collected	Course Outcome s
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignment s		Assign- ments	15	--	Assignmen t Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assign- ments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Scripts	1,2,3,4,5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Procedure	10
2	Performance	20
3	Result	10
5	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	3	3	-	3	3	3
2	3	2	-	3	3	-	3	3	-
3	3	-	-	3	3	-	3	3	3
4	3	-	-	3	3	-	3	3	3
5	3	-	-	3	3	-	3	3	3
6	3	2	-	3	3	-	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Chemical Processing of Textiles	NCUTE publication 2002	
2.	Technology of Printing Vol.IV	V.A.Shenai, Sevak Publication, 2003	9783659686047
3.	Dyeing and Chemical Technology of Textile Fibres	E R Trotman, , John Wiley & Sons Inc; 6 Sub edition .1985	978-047180910
4.	Technology of Dyeing	V.A Shenai, Sevak Publications, 1984	
5.	Technology of Textile Processing	V. A. Shenai, Sevak publication , Vol X, 1987	OCLC:313590523

❖ **E-REFERENCES:**

1. <https://textilelearner.net/dyeing-of-cotton-fabric-with-reactive-dyes/> , assessed on 18th January 2022
2. https://www.researchgate.net/figure/Types-of-dyes-used-for-the-dyeing-of-protein-fibers_fig3_351022496 , assessed on 18th January 2022
3. <https://www.slideshare.net/DuraisamyRamesh1/printing-methods-styles>, assessed on 18th January 2022
4. <https://www.slideshare.net/DuraisamyRamesh1/printing-methods-styles>, assessed on 18th January 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Beaker dyeing machine
2. Weighing balance
3. Oven
4. Scissors
5. Beaker
6. Hot plate
7. Blocks
8. Screens
9. Glass Rod
10. Thermometer

11. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Mrs. L. S. Chakraborty	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
2	Mr M.V.Gokhale	Lecturer in Chemical Processing	Mahila Nikalas ,Nagpur



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
COURSE CATEGORY	: PROGRAMME CORE COURSE
COURSE CODE	: TX211G^s
COURSE TITLE	: ADVANCED FABRIC STRUCTURE
TEACHING SCHEME	: TH:03; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Knowledge of advanced woven structures and its ornamentation is required as per the specific need of industries and society. Different weaving equipments like dobby, jacquard and drop box are used to produce various types of advanced fabric design on weaving machine. This course is aimed to provide the necessary knowledge and skills to produce compound fabric structures like- Bedford cord, pique, pile fabrics and warp backed, weft backed, gauze and leno structures.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Design different semi-compound fabric structures.
2. Develop different back cloth design.
3. Construct various double cloth weaves.
4. Create various ornamented fabrics using extra thread principle.
5. Prepare the various leno structures.
6. Design various pile structure using given specification.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Bedford cord and welt structures	1.a Classify the given semi-compound fabric structures 1.b Draw design of Bedford cord structures for the given specification 1.c Illustrate the given methods for producing wadded effects 1.d Draw drafting plan, lifting plan and cross-section view for the given Bedford cord and welt structure 1.e Prepare design of welt structure for the given specification. 1.f Choose the quality particulars and end uses of given type of weaves.	1.1 Classification of Bedford cord structure and necessary loom equipment. 1.2 Construction of Plain-Faced Bedford cord , Development of Bedford cord arranged with different widths of the cord and alternate picks, 1.3 Concept of wadding ends and Construction of wadded plain faced Bedford cord. 1.4 Development of Twill Faced Bedford Cord and wadded Twill Faced Bedford Cord Formation 1.5 Classification of welt structure, Construction of ordinary welt structure, weft wadded welts structure, fast back welts structure. 1.6 Standard quality particulars and end uses of Bedford cord and welt structures	10
2. Backed Structures	2.a Prepare design for given specification of backed structure 2.b Draw drafting plan and lifting plan for the given type of backed weaves. 2.c Draw cross-sectional view for the given type of backed weaves.	2.1 Concept development and purpose of manufacturing of Backed Cloths, Types of Backed Cloths. 2.2 Step by step development of Warp Backed Cloth. 2.3 Step by step development of weft Backed Cloth.	06
3. Double Cloths	3.a Illustrate the given methods of producing the double cloth. 3.b Prepare design of double cloth structure for the given specification on graph paper. 3.c Draw drafting plan and lifting plan for the given type of	3.1 Classification of double cloths. Construction of self stitched double cloth and method of stitching. 3.2 Construction of double cloth with wadded warp and weft. 3.3 Development of Reversible double cloth designs. Development of interchanging double cloth design 3.4 Constructions of center warp stitching double cloth and	08

	double cloth weaves. 3.d Draw cross-sectional view for the given type of double cloth weaves.	center weft stitching double cloth.	
4. Figuring With Extra Threads	4.a Describe method of production with Extra thread. 4.b Prepare point paper designs of extra warp figuring weave for given repeat 4.c Draw point paper designs of extra weft figuring weave for given repeat 4.d Choose the quality particulars & end uses of given extra figured fabric	4.1 Object of extra threads for ornamentation. Methods of production, loom equipment necessary for manufacturing extra thread figured fabric, Methods of removal of the surplus figuring Threads 4.2 Figuring with Extra Warp thread, Extra warp figuring with single colour and two colours. 4.3 Figuring with Extra Weft thread, Extra weft figuring with single colour and two colours 4.4 Standard quality particulars and end uses of extra figured fabric	06
5. Leno Structures	5.a Describe given types of leno sheds 5.b Prepare point paper designs of given leno weave 5.c Draw point paper designs of given net leno	5.1 Description of Leno structures with uses, Principle of Leno Structure. Basic sheds of Leno Weaving 5.2 Methods of producing Leno structure. Leno weaving with flat steel doup 5.3 Introduction to Russian cord and simple net leno interlacing design.	8
6. Pile Structures	6.a Classify pile structures on given points 6.b Design weft pile structures for the given specification on graph paper. 6.c Design warps pile structures for the given specification on graph paper. 6.d Choose the quality particulars & end uses of given pile fabric.	6.1 Pile Structures: Classification of pile structure 6.2 Types of velveteen: Plain back velveteen, plain velveteen with fast pile structure, twill back velveteen, weft plushes, corded velveteen. Importance of Length and density of pile in velveteen. Cutting and quality aspects of plain velveteen. 6.3 Types of Warp pile structures. Pile formation in terry pile weaving, loom requirement for terry weaving, various terry pile designs. Warp Pile Fabrics produced with aids of wires and carpet structure 6.4 Standard quality particulars and end uses of pile fabric.	10
Total Hrs			48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Use analysis tool kit to analyze given Bedford cord weave fabric sample to i) Identify warp & weft direction in given sample ii) Identify interlacement of warp & weft iii) Measure Ends/inch & Picks/inch iv) Estimate warp count, weft count, EPI & PPI, twist direction and crimp %.	Bedford cord and Weft structures	02
2	Use analysis tool kit to analyze given Bedford cord weave fabric sample to i) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of ii) Represent the design, draft and peg plan on point paper		02
3	Develop welt structure on point paper based on given specification to construct draft, peg plan and cross-section for the same		02
4	Develop Back structure on point paper based on given specification to construct draft, peg plan and cross-section for the same	Backed Structures	04
5	Use analysis tool kit to analyze given Double cloth weave fabric sample to i) Identify warp & weft direction in given sample ii) Identify interlacement of warp & weft iii) Measure Ends/inch & Picks/inch iv) Estimate warp count, weft count, EPI & PPI, twist direction and crimp %.	Double Cloths	02
6	Use analysis tool kit to analyze given Double cloth weave fabric sample to i) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of ii) Represent the design, draft and peg plan on point paper		04
7	Develop following structure on point paper based on given specification to construct draft, peg plan and cross-section for the same i) Interchanging double cloth ii) Wadded double cloth		04
8	Use analysis tool kit to analyze given Figuring With Extra Threads weave fabric sample to i) Identify warp & weft direction in given sample ii) Identify interlacement of warp & weft iii) Measure Ends/inch & Picks/inch iv) Estimate warp count, weft count, EPI & PPI, twist direction and crimp %.	Figuring With Extra Threads	02
9	Use analysis tool kit to analyze given Figuring With Extra Threads weave fabric sample to i) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of ii) Represent the design, draft and peg plan on point paper		02
10	Develop Leno structure on point paper based on given specification to construct draft, peg plan for the same	Leno Structures	04

11	Use analysis tool kit to analyze given Pile weave fabric sample to i) Identify warp & weft direction in given sample ii) Identify interlacement of warp & weft iii) Measure Ends/inch & Picks/inch iv) Estimate warp count, weft count, EPI & PPI, twist direction and crimp %.	Pile Structure	02
12	Use analysis tool kit to analyze given Pile weave fabric sample to i) Calculate warp cover factor, weft cover factor, fabric cover factor, weight in grams/sq.mtr of ii) Represent the design, draft and peg plan on point paper		02
Total			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Bedford cord and welt structures	02(02)	03(03)	06(03)	11(08)
02	Backed Structures	02(00)	03(00)	03(03)	08(03)
03	Double Cloths	02(02)	03(03)	06(03)	11(08)
04	Figuring With Extra Threads	02(00)	03(03)	03(00)	08(03)
05	Leno Structures	02(00)	03(00)	06(06)	11(06)
06	Pile Structures	02(02)	03(03)	06(03)	11(08)
	Total	12(06)	18(12)	30(18)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	3	R	2	6	R	2										
02	1	U	3	2	U	3	3	U	3	1	U	3	3	U	3				3/5
03	4	U	3	5	U	3	6	U	3	4	A	3	6	A	3				3/5
04	1	A	3	1	A	3	2	A	3	1	A	3	2	A	3				3/5
05	4	A	3	5	A	3	5	A	3	3	A	3	6	A	3				3/5
06	3	A	6	6	A	6	5	A	6										2/3

T= Unit/Topic Number
R-Remember

L= Level of Question
U-Understand

M= Marks
A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6.
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Practical Answer Sheets	1,2,3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing weave plan on graph paper	10
2	Fabric Analysis	20
3	Calculation, Result, Drawing Graphs	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	3	3	-	-	3	3	-
CO2	3	-	3	3	-	-	3	3	-
CO3	3	-	3	3	-	-	3	3	-
CO4	3	-	3	3	-	-	3	3	-
CO5	3	-	3	3	-	-	3	3	-
CO6	3	-	3	3	-	-	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Watson's Textile Design and Colour: Elementary Weaves and Figured Fabrics. 7th ed.	<i>Watson, William Grosicki Z J, Newnes- Butterworths, 1979</i>	9780408705158
2	Watson's Advanced Textile Design	Z. J. Grosicki , Woodhead Publishing,	9781855739963/
3	Grammar of Textile Design	H.Nisbet , Abhishek Publisher, Chandigarh	9788182475144

❖ **E-REFERENCES:**

- ❖ <https://www.youtube.com/watch?v=RMXgNrSRVfM> accessed on 5th October 2022
- ❖ <https://www.youtube.com/watch?v=yEZmttAy2c> accessed on 5th October 2022
- ❖ <https://www.youtube.com/watch?v=qD6bKAhlDuI> accessed on 5th October 2022

- ❖ <https://nptel.ac.in/content/storage2/courses/116102005/download/mcqm7.htm> accessed on 5th October 2022
- ❖ <https://www.slideshare.net/txrockers/fabric-structureanddesign-15667875> accessed on 5th October 2022
- ❖ <https://nptel.ac.in/courses/116/102/116102005/> accessed on 5th October 2022

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

- ❖ Hand loom for sample preparation
- ❖ Pick counting glass
- ❖ Pick glass to find out EPI, PPI, twist direction and type of weaves
- ❖ Beesley balance
- ❖ Electronic balance
- ❖ Counting lens
- ❖ Cutting template
- ❖ Scissors
- ❖ Measuring scales
- ❖ Educational videos/animation films on preparation of different fabric structures
- ❖ Fabric Analysis sheets

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr. S. G. Gaikwad	Lecturer in Textile Engineering	Government Polytechnic, Nagpur.
2.			
3.			
4.			
5.			



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
COURSE CATEGORY	: PROGRAM ELECTIVE COURSE
COURSE CODE	: TX212G
COURSE TITLE	: ADVANCED YARN AND FABRIC MANUFACTURING
TEACHING SCHEME	: TH:04; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HRS.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Students should have the knowledge of modern developments, automation and new methods of Yarn and Fabric Manufacturing. Developments in Ring spinning technology and alternative high production yarn manufacturing technologies make yarn spinning more economical and competitive. In weaving majority of the developments are taking place on the shuttle less looms. To fulfill the industries requirement of highly skilled technicians in modern spinning and weaving area, this course has been designed. It is therefore an important course for textile engineers.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

SECTION 1 – Advanced Yarn Manufacturing

1. Describe Rotor spinning technology.
2. Apply false twist principles and air vortex principle to produce yarn.
3. Compare DREF spun yarns with ring spun yarns.

SECTION 2 – Advanced Fabric Manufacturing

4. Describe the working of projectile weaving loom.
5. Select the required parameters and sequence to weave a fabric on jet weaving loom.
6. Describe weft insertion on Rapier weaving loom and various automation in shuttle less loom

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
SECTION 1 – Advanced Yarn Manufacturing			
1. Compact spinning and open end spinning/Rotor spinning	1.1a List limitations of ring spinning technology. 1.1b Describe basic issues with Ring spun yarn 1.1c Classify unconventional spinning technologies 1.2a Describe the principles of compact spinning. 1.2b Specify Methods of compacting 1.2c Describe Various types of compact spinning systems commercially in Market. 1.2d Describe Advantages and Yarn Characteristics of compact system. 1.3a Describe given Rotor machine. 1.3b Relate yarn structure-properties to process parameters of rotor. 1.3c State the given fibre characteristics for given rotor spinning. 1.3d Outline development in rotor spinning. 1.3e Calculate the twist, speed, draft and production by given data.	1.1 Ring spinning: a. Limitations of ring spinning technology. b. Principles of open end spinning process. c. Classification of unconventional spinning systems 1.2 Compact Spinning a) Basic problems with Ring spun yarn b) Introduction and Principle of compact spinning. c) Methods of Compacting systems d) Types of compact spinning systems in market like COM4 by Rieter, Elite by Suessen , Compact3 by Zinser and Rocos systems e) Advantages of compact spinning and Yarn characteristics of compact spun yarn 1.3 Rotor spinning: a. Principle, Construction and working of rotor machine: feeding, opening, trash removal, fibre transportation to rotor, rotor groove, yarn formation and twist insertion, rotor speed and diameter, rotor cleaning, rotor bearing and drive, navel and tube, winding package. b. Influence of opening roller speed and rotor speed/diameter on yarn structure and quality. Yarn structure and properties of rotor spun yarns, Wrapper fibres, applications of rotor yarns. c. Economics of rotor spinning. Selection of opening roller, rotor, diameter, groove, navel, for processing different materials. d. Fibre characteristics and preparation of raw material for rotor spinning. e. Developments and automation in rotor spinning. f. Twist, speed, draft and production calculations in rotor spinning.	14

2. Twist less spinning	2a. Apply false twist principles and air vortex principle to produce yarn. 2b. Describe machine, process parameters, and application of Air jet and air vortex spun yarns. 2c. Compare structure, properties of air jet, air vortex spun yarns with ring spun yarns. 2d. Draw yarn structure of air jet and air vortex spun	2.1 Concept and Principle of Air jet spinning and Air vortex spinning. 2.2 Construction and working of air jet and air vortex Spinning machines. 2.3 Structure and properties of air jet and air vortex spun yarns. 2.4 Process parameters influencing properties of air jet and air vortex spun yarns. 2.5 Application of air jet and air vortex spun yarns.	08
3. Alternative yarn spinning methods	3a. Apply friction spinning principle to twist the yarn 3b. Describe machine, process parameters, structure, properties and application of DREF spun yarns. 3c. Compare DREF spun yarns with ring spun yarns. 3d. Describe spinning principle, yarn structure, properties and application of (a) Siro spinning; (b) Self twist twisted yarns, (c) Wrap spinning.	3.1 Principle and Working of DREF spinning. 3.2 Structure, properties and application of DREF spun yarns. 3.3 Twist spinning- Siro and Duo spinning - Principles, yarn properties and applications. 3.4 Self-twist spinning- Principles, yarn properties and applications. 3.5 Wrap spinning - Principles, yarn properties and applications.	10
SECTION 2 – Advanced Fabric Manufacturing			
4. Introduction to Shuttle Less Weaving and Weft Insertion by Projectile	4a. Classify shuttle less weaving machine. 4b. Identify the given type of selvage. 4c. Identify the need of weft accumulator. 4d. Identify the features of the projectile weaving loom. 4e. Prepare the weft insertion sequence for given loom. 4f. Describe the principle of torsion picking mechanism. 4g. Identify the features of	4.1 Classification of shuttle-less weaving machines. 4.2 Types of selvage. 4.3 Weft accumulator and weft cutter. 4.4 Main features of projectile weaving loom. 4.5 Transfer of weft end from the projectile feeder to the projectile 4.6 Projectile feeding mechanism 4.7 Weft insertion sequence in projectile weaving machine 4.8 Principle of torsion picking mechanism 4.9 Beat up mechanism on Sulzer loom	10

	Rapier weaving. 4h. Describe beat up mechanism of Sulzer loom.		
5. Weft Insertion by Air Jet And Water Jet	5a. Identify the features of the given weaving loom. 5b. Select required parameters to achieve Quality of air and water.. 5c. Identify type of given Nozzles in Air jet. 5d. Prepare Timing diagram of Air Jet Loom 5e. Choose weft requirement for water jet weaving 5f. Prepare the weft insertion sequence for given loom 5g. Compare Air jet and water jet loom.	5.1 Main features of Air jet and water jet weaving machine 5.2 Quality of Air and water 5.3 Main jet and its operation, Multi Nozzle and Reed Profile of Air jet loom. 5.4 Loom timing diagram and profile reed of Air jet loom 5.5 Weft supply system on Water jet loom 5.6 Picking system of the Water jet loom 5.7 Sequence of weft insertion in Air jet and Water jet looms. 5.8 Compare Air jet and water jet	10
6. Weft Insertion by Rapier and Automation on Loom	6a. Classify Rapier weaving machine. 6b. Describe the weft insertion system on given rapier weaving machine 6c. Prepare Timing diagram of Rapier machine. 6d. Identify the latest automation on weaving loom. 6e. Describe online monitoring system	6.1 Classification of Rapier weaving mechanism. 6.2 Rapier Driving 6.3 Rapier Heads 6.4 Weft insertion methods: Dewas system, Gabler system 6.5 Timing diagram of Rapier machine 6.6 Automation - Electronic shedding, Electronic take up and let off motion, Automatic stop mark prevention. 6.7 Control of fabric Quality at loom state-Variable Pick density, Variable speed, On loom inspection 6.8 On line loom monitoring system	12
Total			64

B: LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
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SECTION 1 – Advanced Yarn Manufacturing			
1	Draw the passage of material through rotor machine.	Compact spinning and open end spinning/Rotor spinning	02
2	Identify parts of rotor machine and determine the speeds, drafts, twists and production rate from the gearing plan of given rotor machine.		04
3	Record the working parameters of air jet spinning machine after watching the video.	Twist less spinning	02
4	Record the working parameters of air vortex spinning machine after watching the video.		02
5	Record the working parameters of alternative yarn spinning machines after watching the video.	Alternative yarn spinning methods	04
6	Draw and compare DREF yarn structure with ring and rotor yarn.		02
Total Hours			16
SECTION 2 – Advanced Fabric Manufacturing			
1	Prepare visit report on following by observing video CD / by visit to a mill a) Identify important parts weft accumulator , weft cutter on shuttle less loom and draw diagram b) Identify different selvages on shuttle less loom and draw diagram	Introduction to Shuttle Less Weaving and Weft Insertion by Projectile	02
2	Prepare visit report on following by observing video CD / by visit to a mill a) Identify features projectile weaving machine b) Draw weft insertion cycle of projectile weaving machine		04
3	Prepare visit report on following by observing video CD / by visit to a mill a) Identify features Airjet weaving machine b) Draw weft insertion cycle of airjet weaving machine	Weft Insertion by Air Jet and Water Jet	02
4	Prepare visit report on following by observing video CD / by visit to a mill a) Identify features Water jet weaving machine b) Draw weft insertion cycle of Water jet weaving machine		02
5	Prepare visit report on following by observing video CD / by visit to a mill a) Identify features Rapier weaving machine b) Draw weft insertion cycle of Rapier weaving machine	Weft Insertion by Rapier and Automation on Loom	04
6	Prepare visit report on following by observing video CD / by visit to a mill a) Electronic shedding, Electronic take up and let off motion b) On line loom monitoring system		02

Total Hours	16
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❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
SECTION 1 – Advanced Yarn Manufacturing					
01	Compact spinning and open end spinning/Rotor spinning	02(02)	05(03)	06(03)	13(08)
02	Twist less spinning	02(02)	02(03)	03(00)	07(05)
03	Alternative yarn spinning methods	02(02)	05(00)	03(03)	10(05)
SECTION 2 – Advanced Fabric Manufacturing					
04	Introduction to Shuttle Less Weaving and Weft Insertion by Projectile	02(02)	02(00)	06(03)	10(05)
05	Weft Insertion by Air Jet and Water Jet	02(02)	05(03)	03(00)	10(05)
06	Weft Insertion by Rapier and Automation on Loom	02(02)	05(03)	03(03)	10(08)
	Total	12(12)	24(12)	24 (12)	60 (36)

R – Remember U – Understand A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER**

T= Unit/Topic Number L= Level of Question M= Marks
 R-Remember U-Understand A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
SECTION 1 – Advanced Yarn Manufacturing																			
01	1	R	2	2	R	2	3	R	2	1	U	2	2	U	2	3	U	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	3	U	3	2	A	3	1	U	3	2	U	3				3/5
03	1	A	3	1	A	3	3	A	3	1	A	3	3	A	3				3/5
SECTION 2 – Advanced Fabric Manufacturing																			
04	4	R	2	5	R	2	6	R	2	4	U	2	5	U	2	6	U	2	6/9
	4	R	2	5	R	2	6	R	2										

05	5	U	3	6	U	3	4	A	3	5	U	3	6	U	3				3/5
06	4	A	3	5	A	3	6	A	3	4	A	3	6	A	3				3/5

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Scripts	1,2,3,4,5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6

	End of Course Survey		End Of The Course	Questionnaires	
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❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing	10
2	Procedure	10
3	Process Analysis	20
5	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	3	3
2	3	-	-	-	-	-	3	3	3
3	3	2	-	2	-	-	3	3	3
4	3	-	-	-	-	-	3	3	3
5	3	-	-	-	-	-	3	3	3
6	3	2	-	2	-	-	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Technology of short staple spinning. Vol. 1-7	W. Klein, The Textile Institute Manchester	13-978-3-9523173-0-3

2.	New Spinning Systems	R. V. Mahendra Gowda, NCUTE Publications, IIT Delhi	
3.	Advances in Yarn Spinning Technology	C. Lawrence, 1st Edition, 2016, Woodhead Publishing.	9780081014745
4.	Fundamentals of Spun Yarn Technology	Carl A. Lawrence, March 28, 2003 by CRC Press	9781566768214
5.	Weaving Machine, Mechanisms, Management	Dr.M.K. Talukdar, D.B.Ajagaonkar Mahajan Publication, First Edition, 2000	9788185401164
6.	Principles of Weaving.	Marks, R.; Robinson, A.T.C.. Published by The Textile Institute, 1976	9780900739255
7.	Weaving Technology and operations	Ormerod. A., Sondhelm. W.S., Butterworth and Co.	9781870812764
8.	Weaving: Conversion of yarn to fabric	Lord P.R. and Mohamed M.H. Merrow Publication , Second Edition, 1992	9781845692902
9.	Woven Fabric Production – II	Thiagarajar Polytechnic college ,NCTUE Publication, 2002	-

❖ E-REFERENCES:

- ❖ <http://nptel.ac.in/courses/116102038/23> , accessed on 28th August, 2022
- ❖ <http://www.rieter.com/cz/rikipedia/articles/rotor-spinning/the-importance-of-rotor-spinning/historical-background/> accessed on 28th August, 2022
- ❖ <http://www.rieter.com/cz/rikipedia/articles/alternative-spinning-systems/alternative-spinning-processes/synopsis/introduction/> accessed on 28th August, 2022
- ❖ <http://textilelearner.blogspot.in> assessed on 28th August, 2022
- ❖ www.nptl.com assessed on 28th August, 2022
- ❖ www.scribd.com/doc/86427900/Preparatory-Process-for-Weaving assessed on 28th August, 2022
- ❖ <http://textilelearner.blogspot.in/2012/01/projectile-loop-projectile-weaving.html> assessed on 28th August, 2022
- ❖ www.rapierloom.in/rapier-loom.html assessed on 28th August, 2022
- ❖ <http://textilelearner.blogspot.in/2013/01/main-parts-of-air-jet-loom-for-weft.html> assessed on 28th August, 2022

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

Visit to modern spinning mills. Rotor spinning machine, Air jet spinning machine, DREF spinning machine, Air vortex spinning machine other new spinning methods.

Textile Laboratory –Machine set up, modern weaving machines

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
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1.	Dr C.P Kapse	Head of the Department	Government Polytechnic Nagpur
2.	Dr S.G.Gaikwad	Sr. Lecturer	Government Polytechnic Nagpur
3.	Lipika Chakraborty	Lecturer	Government Polytechnic Nagpur



(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
COURSE CATEGORY	: PROGRAM ELECTIVE COURSE
COURSE CODE	: TX213G
COURSE TITLE	: HIGH PERFORMANCE FIBRE
TEACHING SCHEME	: TH:04; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ RATIONALE:

Textile Manufactures students should know the high performance fibres which are having wide applications in technical textiles. The new technology of manufacturing high performance fibres is need of the diploma students. The objective of this course is to impart technical knowledge of fibre formation, properties and end use applications of the new emerging fibres.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Classify the high performance fibre.
2. Choose the properties required for glass and ceramic fibre.
3. Characterise aramid fibres on their performance and structure.
4. Examine the performance factor for chemical resistant fibre.
5. Analyse the special fibre according to its end application.
6. Elaborate the manufacturing technology of high density polyethylene fibre.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to High performance fibre	1a. Classify the high performance fibre on the given parameters. 1b. Distinguish apparel and high performance fibre on the given parameters.	1.1 Introduction to High Performance fibers- Drawbacks of conventional fibers, classification of high performance fibres 1.2 Comparison between apparel and high performance fibre.	08
2. Inorganic fibres	2a. Apply glass fibre for the given end use. 2b. Choose the given properties required for any ceramic fibre.	2.1 Glass fibres introduction, physical properties, types of glass fibres, manufacturing of E glass fibre, application of glass fibres. 2.2 Ceramic fibres- Classification and fibre formation, composition, structure, properties and application.	12
3. Aramid and carbon fibres	3a. Characterise aramid fibres on the given performance. 3b. Describe the manufacturing process of given carbon fibre.	3.1 Types of aramid fibre, characteristics of aramid fibre, performance and application. 3.2 Carbon fibres introduction, physical properties, PAN based carbon fibre manufacturing, application of carbon fibres	12
4. Chemically resistant fibres	4a. Examine the given performance factor for PEEK fibre. 4b. Compare the given fibre on the basis of physical and chemical properties.	4.1 Chemically resistant fibre - PEEK (Polyether ether ketone fibre), Fibre performance factor, products, physical and chemical properties, end use applications. 4.2 Fluorinated fibres – Poly(vinylidene fluoride) PVDF and poly(tetrafluoroethylene) PTFE fibres, various physical and chemical properties, heat and chemical resistance, application	10
5. Electro spun and speciality fibres	5a. Describe with sketch electro spinning of fibre. 5b. Analyse the given special fibre according to its end application.	5.1 Basic concepts of electro spinning, characteristics and applications. 5.2 Speciality fibres- Photovoltaic fibres, piezo electric fibres, photochromic fibres, various properties and end use application.	12
6. Gel spun polyethylene fibres	6a. Elaborate the manufacturing technology of given high density polyethylene fibre. 6b. Apply given HDPE fibre for relevant application.	6.1 Molecular character, Gel spinning, technology of High density polyethylene fibre- Dyneema and spectra. 6.2 HDPE fibre Properties and application in various fields	10
Total HRs			64

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Study the characteristics of high performance fibre.	Introduction to High performance fibre	02
2	Compare given apparel fibre with high performance fibre.		02
3	Draw the process flow chart of E glass fibre manufacturing by watching the video.	Inorganic fibres	04
4	Draw the process flow chart of basalt fibre manufacturing by watching the video.		02
5	Examine the various applications of aramid fibres by watching the video.	Aramid and carbon fibres	04
6	Draw the process flow chart of carbon fibre manufacturing by watching the video.		04
7	Draw the process flow chart of PEEK fibre manufacturing by watching the video.	Chemically resistant fibres	02
8	Compare PVDF fibre with PTFE fibre on end use.		02
9	Draw and describe electrospinning fibre by watching the video.	Electro spun and speciality fibres	02
10	Study the applications of Photovoltaic fibres, and piezo electric fibres by watching the video.		02
11	Draw and describe gel of spinning fibre by watching the video.	Gel spun polyethylene fibres	04
12	Study the application of HDPE fibre by watching the video.		02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction to High performance fibre	02(02)	03(03)	03(00)	08(05)
02	Inorganic fibres	02(00)	06(03)	03(03)	11(06)
03	Aramid and carbon fibres	02(00)	03(03)	06(06)	11(09)
04	Chemically resistant fibres	02(02)	06(03)	03 (00)	11(05)
05	Electro spun and speciality fibres	02(00)	00(03)	06(03)	08 (06)
06	Gel spun polyethylene fibres	02(02)	06(00)	03(03)	11(05)
	Total	12(06)	24(15)	24 (15)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	4	R	2	6	R	2										
02	1	U	3	2	U	3	2	U	3	1	U	3	2	U	3				3/5
03	3	U	3	1	A	3	2	A	3	3	U	3	2	A	3				3/5
04	4	U	3	4	U	3	4	A	3	4	U	3	5	U	3				3/5
05	6	U	3	6	U	3	6	A	3	5	U	3	6	A	3				3/5
06	3	A	6	5	A	6	3	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Who m	Frequenc y	Max Mark s	Min Mark s	Evidence Collected	Course Outcome s
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignment s		Assign- ments	15	--	Assignmen t Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assign- ments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Scripts	1,2,3,4,5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing	10
2	Procedure	10
3	Process Analysis	20
5	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	3	-	3	3	-
CO2	3	3	-	-	3	-	3	3	3
CO3	3	3	-	3	3	-	3	3	3
CO4	3	3	-	3	3	-	3	3	3
CO5	3	3	-	-	3	-	3	3	3
CO6	-	-	-	3	3	-	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Advances in Yarn Spinning Technology	Lawrence C. A. , Woodhead Publishing, 2010	81-219-1053-6
2.	New Fibres	Hongu Tatsuya & Philips G.O, Woodhead pub.Ltd., Cambridge, U.K. 1997	81-219-2440-5
3.	High Performance Fibres	J. Hearle, Woodhead Publishing	13: 978-0-07-059357-2
4.	New millennium fibres	Tatsuya Hongu, Glyn O. Phillips and Machigo Takigami.	978-81-224-1042-6

❖ **E-REFERENCES:**

- 1) <https://www.slideshare.net/SyedAdilBadshah/inorganic-fibers-and-materials-of-carbon> , assessed on 22 feb2022
- 2) <https://www.mdpi.com/2073-4360/12/2/492> , assessed on 22 feb2022
- 3) <http://182.160.97.198:8080/xmlui/bitstream/handle/123456789/1227/8.%20Chemically%20resistant%20fibres.pdf?sequence=9> , assessed on 22 feb2022
- 4) <https://pur-carbon.com/blogs/news/understanding-the-subtle-differences-between-carbon-fiber-and-aramid-fiber> , assessed on 22 feb2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Scanning Electron Microscope, Thermograph, X-ray diffraction machine, etc

LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
3.	Mrs. L. S. Chakraborty	Lecturer in Textile Manufactures	Government Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
LEVEL NAME	: PROGRAM ELLECTIVE COURSE
COURSE CODE	: TX214G^{\$}
COURSE TITLE	: KNITTING TECHNOLOGY
TEACHING SCHEME	: TH: 03; TU:00 ;PR:02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HRs.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs(External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Knitting is a technique of making fabric. Knitting requires less yarn preparatory process compared to weaving and gives high production. The aim of this course is to develop the competency of knitting process and equipment used in the industry. This course is important for textile engineers as growth for knitted textile are increasing day by day due to better comfort provided by knitted textile as compared to woven textile.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Classify the knitting machines.
2. Draw knitting cycle of different needles.
3. Choose the characteristics of weft knitted structure.
4. Plan the warp preparation for warp knitting
5. Select the knitting elements and knitting cycle of warp knitting machines.
6. Calculate the production of circular weft knitting machine.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Introduction to Knitting	1a. Draw the sketches of given fabric forming methods. 1b. Analyze the given fabric structure for their properties . 1c. Classify the knitting machines on given points	1.1 Methods of fabric forming systems, reasons of growth of knitting industry. 1.2 Comparison of weaving and knitting with respect to process, structure and properties of fabric. 1.3 Definitions of basic terms in knitting, Classification of knitting machines	06
2. Weft knitting elements	2a. Illustrate the given knitting element with sketch. 2b. Draw knitting cycle of given needle. 2c. Describe with sketch the passage of yarn for given type of weft knitting. 2d. State the developments in given knitting machine.	2.1 Knitting machine elements: - cylinder, sinker, creels, cams, positive feeder, dial, spreader and take down mechanism. 2.2 Knitting cycle of latch, spring beard and compound needle 2.3 Single jersey circular knitting machine and Flat knitting machine: passage and knitting cycle 2.4 Developments in weft knitting.	08
3. Basic weft-knit structures	3a. Choose the characteristics of given type of stitches. 3b. Draw the symbolic and notation of given type of the weft knitted structure. 3c. Draw the given single knit and double knit structures 3d. Identify the causes of given fabric defects in weft knitted fabric.	3.1 Characteristics of basic stitches and their effects in fabric properties(Knit, Tuck and Float). 3.2 Classification of weft knit structures- Single jersey structure, characteristics. 3.3 Double jersey structures with their features and properties- a) Rib knit Structure(1x1) b) Interlock knit structure (1x1) c) Purl knit structure(1x1) 3.4 Weft knit fabric defects in single jersey and double jersey fabric with its causes.	10
4. Weft Knitting Calculations	4a. Calculate the different parameters of circular weft knitting machine by given data. 4b. Calculate the production parameters of weft knitting machine by given data.	4.1 Weft knitting calculations- Machine Gauge, Relation between yarn number and machine guage. Cylinder diameter and cut, cover factor or tightness factor . 4.2 Production of knitting machine, weight per linear yard and square yard, fabric width ,yarn diameter, number of needles and Stitch length.	10
5. Warp knitting	5a. Draw the given basic structure of warp knitting. 5b. Plan the warp preparation for the given warp knitting. 5c. Differentiate warp knitting with weft knitting on given parameters.	5.1 Basic warp knit structure and terms- overlap, underlap, close lap and open lap. 5.2 Preparation for warp knitting- yarn properties, winding, warping 5.3 Comparison of warp knitting, weft knitting and weaving: structure, properties and process.	06

6. Warp knitting machines	6a. Select the knitting elements and knitting cycle for the given type of warp knitting. 6b. Compare Warp knitting machines on the given parameters. 6c. Classify the given type of fault with causes. 6d. State the developments taken place in warp knitting machine.	6.1 Tricot and Raschel warp knitting machine- Passage, knitting elements, knitting cycle. 6.2 Compare Tricot and Raschel knitting machine: needles, machine gauge, guide bar, cloth take-up, yarn used, properties, speed and versatility 6.3 Common faults of warp knitted fabric: dropped stitches, yarn breakages, yarn loading, cutting and whiskering, horizontal streaks and vertical streaks. 6.4 Developments in Warp knitting machine.	08
Total			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Draw sketches of different terms in knitting with thread diagram.	Introduction to Knitting	2
2	Observe and compare the given knitted and woven fabric.		2
3	Draw the weft knitting cycle of latch, beard and compound needle after viewing the video clip.	Weft knitting elements	2
4	Sketch the passage of the yarn through circular weft knitting machine with description of relevant machine parts and processes after viewing the video clip.		2
5	Sketch the passage of the yarn through flat knitting machine with description of relevant machine parts and processes after viewing the video clip.		2
6	Demonstrate principle stitches used in weft knitting(with the help of thick yarn /wire) and required settings on machine after viewing the video clip.	Basic weft– knit structures	2
7	Analyse single jersey knitted fabric – for courses per Inch, wales per Inch, stitch length and count of yarn.		4
8	Measure stitch length and GSM of the given knitted sample.	Weft Knitting Calculations	4
9	Calculate the production of circular single jersey weft knitting machine per linear yard and weight per hour from the given data.		4
10	Demonstrate lapping structure of warp knitting(with the help of thick yarn /wire) and required settings on machine after viewing the video clip.	Warp knitting	2
11	Observe and compare Warp knitting with weft knitting on given parameters.		2
12	Sketch the passage of the yarn through warp knitting machine with description of relevant machine parts and processes after viewing the video clip.	Warp knitting machines	2
13	Draw and describe the knitting cycle of Tricot and Raschal warp knitting machine after viewing the video clip.		2
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

R – Remember U – Understand A – Analyze / Apply

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction to Knitting	02(02)	03(03)	03(00)	08(05)
02	Weft knitting elements	02(00)	06(03)	03(03)	11(06)
03	Basic weft –knit structures	04(00)	03(03)	06(03)	13(06)
04	Weft Knitting Calculations	02(02)	06(00)	06(06)	14(06)
05	Warp knitting	00(02)	06(03)	00 (00)	06(05)
06	Warp knitting machines	02(00)	00(03)	06(03)	08(06)
	Total	12(06)	24(15)	24 (15)	60 (36)

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	3	R	2	6	R	2	4	R	2	6/9
	1	R	2	4	R	2	5	R	2										
02	1	U	3	2	U	3	2	U	3	1	U	3	2	U	3				3/5
03	3	U	3	4	U	3	4	U	3	3	U	3	2	A	3				3/5
04	5	U	3	5	U	3	2	A	3	6	U	3	5	U	3				3/5
05	3	A	3	3	A	3	1	A	3	3	A	3	6	A	3				3/5
06	6	A	6	4	A	6	4	A	6										2/3

T= Unit/Topic Number L= Level of Question M= Marks

R-Remember U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	ST	Students	After every Practical	20	--	Practical Answer Sheets	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Sheets	1, 2, 3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Drawing of passage and parts of the machine	10
2	Description of the Process	20
3	Calculation, Result	10
4	Viva voce	10
	TOTAL	50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							PSO	
	1	2	3	4	5	6	7	1	2
1	3						3	3	
2	3		3	3			3	3	
3	3		3	3			3	3	3
4	3						3	3	
5	3		3	3			3	3	
6	3	3	3	3			3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Knitting Technology	D B Ajgaokar, Universal publishing Corp, 1998	9788185027340
2	Advances in Knitting Technology	Kin-Fan Au, Woodhead Publishing, 2016	9780081017173
3	Knitting Technology	D.Spenser , Pergamon Press, 1989	9781855733336
4	Knitting Technology	NCUTE, IIT Delhi, 2003	-
	Fundamentals and Advances in Knitting Technology	S.C.Ray, Woodhead Publications	9789380308166

❖ E-REFERENCES:

1. <http://www.textileassociationindia.org/> assessed on 27th January 2022
2. <http://nptel.ac.in/courses/116102008/> assessed on 27th January 2022

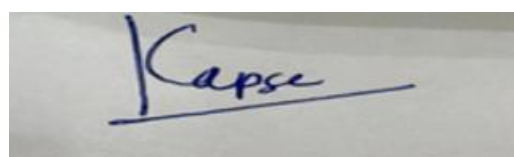
3. <https://nptel.ac.in/courses/116/102/116102008/> assessed on 27th January 2022.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

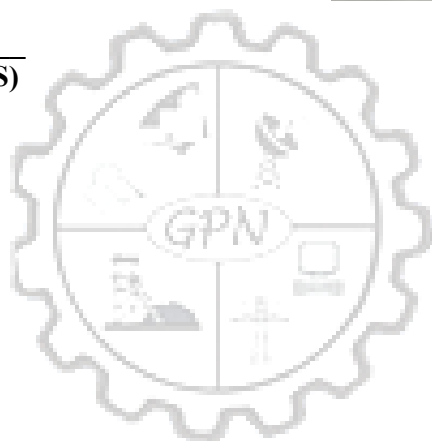
Circular knitting machine, latch needle, spring beard needle, compound needle, cams, guides, GSM cutter.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Mrs. L. S. Chakraborty	Lecturer in Textile Technology	Government Polytechnic, Nagpur.



(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
LEVEL NAME	: PROGRAM ELECTIVE COURSE
COURSE CODE	: TX215G^s
COURSE TITLE	: TEXTILE COMPOSITE
TEACHING SCHEME	: TH: 03; TU:00 ;PR:02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HRs.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs(External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Textile composites, which are a combination of polymer matrix and textile reinforcements, provide an attractive alternative to unidirectional (UD) composites as they enable easier and automated manufacturing of complex component shapes. This course is important for textile engineers AS Textile composite has covered nearly 50 % of market share of Technical Textiles.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. List Characteristics of Composite fibre.
2. Establish Process-property-microstructure relationship.
3. Enlist the phase changematerials.
4. Summaries' Breathable textile.
5. Examine Nanofiber Production.
6. Applications of hybrid bio- composites.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Introduction to Composite Textiles	1a. Explain review of fabric reinforcement architectures. 1b. List Characteristics of Composite fibre.	1.1 Textile terms and definitions. Areal weight, tow count, cover factor, etc., In- plane characterization (Fabric testing) 1.2 Thermal characterization of fabrics. Through-plane characterization for single or multiple layers (volumes fraction pressure, nesting)	06
2. Application of Composite fabrics	2a. Intemperate Drap (natural) and conformability (assisted) to curved surfaces 2b. Make use of Permeability to liquid resin/molten polymers 2c. Establish Process-property-Microstructure relationship.	2.1 Drap testing and comfortable properties of given sample. 2.2 Automated handling of fabrics	08
3. Intelligent Textiles	3a. Define smart and intelligent textiles: 3b. Explain Textile with high protection and comfort properties. 3c. Enlist the phase change materials.	3.1 Passive and active functionality, components of smart technology, Research areas related to smart textiles. 3.2 Extreme winter clothing with low heat Transmission. Heat absorbing and heat storing systems, variable heat absorption surfaces. 3.3 Heat balance and thermo physical comfort. Phase change Technology. Incorporation of PCMs in fibres and fabrics. Measurement of thermo-regulation properties of fabrics with micro PCMs.	10
4. Solar Textiles	4a. Explain Solar Textiles 4b. Interpret Chromic materials 4c. Outline Shape memory Materials 4d. Summarise Breathable textile.	4.1 Solar cells, Textile fibres as substrate, technological specification for fibres as sole cell, conductive layer for photovoltaic. Manufacture of PV fabrics. 4.2 Environmentally sensitive textiles: photochromic and thermo chromic: chameleonic fabrics. Electrochromic materials. 4.3 Stimuli sensitive polymers such as temperature, pH, ionic, magnetic sensitive materials, design and their applications to textile. Potential use of shape memory polymer in smart textile.	10

5. Production of Nano fibre	5a. Examine Nanofiber Production 5b. Contrast Continuous yarns form electro spun nanofibres 5c. Simplify Producing nanofiber structures by electro spinning for tissue engineering	5.1 Electro spinning of nanofibers and the charge injection method. 5.2 Controlling fiber orientation. Producing non continuous or short yarns. Producing continuous yarns. 5.3 Fabrication of nanofibrous scaffolds. Characterization of nanofibrous scaffolds. Cell-scaffold interaction.	06
6. GreenComposites	6a. Processing, Characteristics and Application for Textiles. 6b. Applications of hybrid bio-composites.	6.1 Use of biodegradable material for textile composite. 6.2 Sisal-fiber-reinforced, epoxidized non-edible oil-based epoxy green composites.	08
Total			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify different Materials for composite Textiles	Introduction to CompositeTextiles	02
2	Tensile testing of Raw materials used in composite		04
3	Testing of permeability test on composite textiles	Application of Compositefabrics	02
4	Measurement of thermo-regulation properties of fabrics with micro PCMs.	Intelligent Textiles	02
5	Demonstrate the smart textiles.		04
6	Check the comfort properties.	Solar Textiles	02
7	Demonstrate the process of manufacturing electrochromic materials.		02
8	Test the solar textile substrate.		02
9	Demonstrate electro spinning process.	Production of Nano fibres	04
10	Check the properties of nano fibres		04
11	Identify the green composites from the given material	Green Composites	2
12	Perform the test for green composites.		2
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

R – Remember U – Understand A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

Unit No.	Bit 1 Units Bit 2						Levels from Cognition Process Dimension												Total Marks option
							Bit 3 R			Bit 4 U			Bit 5 A			Bit 6			
	T	L	I	M	T	L	T	L	T	L	T	L	T	L	T	L	M		
01	Introduction To Composites						02(02)			03(03)								08(05)	
02	Application of Composite fabrics						02(00)			06(03)								11(06) ⁹	
	1	R	2	5	R	2	4	R	2										
03	Intelligent Textiles						04(00)			03(03)								13(06) ₅	
04	Solar Textiles						02(02)			06(00)								14(06) ₅	
05	Production of Nano fibre						00(02)			06(03)								06(05) ₅	
	1	U	3	5	U	3	2	A	3	6	U	3	5	U	00	3	(00)		
06	Green Composites						02(00)			00(03)								08(06) ₅	
05	Total						12(06)			24(15)								60(36)	
06	6	A	6	4	A	6	4	A	6									2/3	

T= Unit/Topic Number L= Level of Question M= Marks

R-Remember U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6

	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	ST	Students	After every Practical	20	--	Practical Answer Sheets	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Sheets	1, 2, 3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Drawing of passage and parts of the machine	10
2	Description of the Process	20
3	Calculation, Result	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	
	1	2	3	4	5	6	7	1	2
1	3						3	3	3
2	3		3	3			3	3	3
3	3		3	3			3	3	3
4	3						3	3	3
5	3		3	3			3	3	3
6	3	3	3	3			3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Green composites	Sabu Thomas, Preetha Balakrishnan, 2021, Spinger	
2	Intelligent Textiles and Clothing	H Mattila. Elsevier, 2001	9781845690052
3	Natural Fibre Textile Composite Engineering	Magdi El Missiry , 2017, CRC Press	9781771885546
4	Solar Textiles(The Flexible Solution for Solar Power)	Robert Mather, John Wilson, 2022, CRC Press	9781003147152

❖ **E-REFERENCES:**

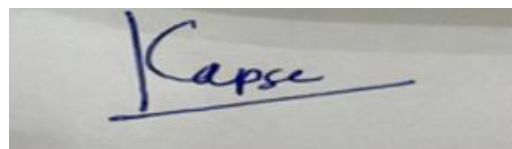
1. <https://www.textilesphere.com/2019/08/solar-textiles.html>, assessed on 27th January 2022
2. <https://textilelearner.net/green-composites-types-properties>, assessed on 27th January 2022
3. <https://encyclopedia.pub/entry/14594>, assessed on 27th January 2022.
4. <https://www.sciencedirect.com/topics/engineering/producing-nanofibres>, assessed on 27th January 2022.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Universal Tensile tester, Bursting tester, puncture resistant tester, composite hardness tester, etc

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	Head of Textile Department	Government Polytechnic, Nagpur.



(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

**PROGRAMME : DIPLOMA IN AE/AI/CM/CE/EC/EE/IT/MC/ME/MT/
PK/TX/TR**

COURSE CATEGORY: HUMANITIES AND SOCIAL SCIENCE COURSE

COURSE CODE : ES351G

COURSE TITLE : ENTREPRENEURSHIP AND START UP

TEACHING SCHEME : TH: 02; TU: 00; PR: 02 (CLOCK HRS.)

TOTAL CREDITS : 03 (1 TH/TU CREDIT = 1 CLOCK HR., 1PR CREDIT = 2 CLOCK HR.)

TH. TEE EXAM : --

PR. TEE EXAM : --

PT. EXAM : --

RATIONALE:

Entrepreneurship as a mind set and a way of looking toward opportunity, focus and creativity. It's about creating value for customers, investor, entrepreneur, gaining independent in engineering career. Taking bold risk and solving challenges with undefined solution to be an entrepreneur, you need to have the ability to innovate, to improve the old and invent the new. In recent times, our society is influenced by knowledge creation and technological advancements. Competencies affecting Innovation and creativity have become important in all walks of life, including business context. This makes entrepreneurship education even more important for enhancing quality of life. Entrepreneurship plays an influential role in the economic growth and development of the nation. As the world economy is changing so is the dynamism of the business world. The aim of this course is to instil and kindle the spirit of Entrepreneurship amongst students. The idea of this course is to create job providers rather than job seekers.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to

1. Develop Entrepreneurial mindset.
2. Select self-employment as a viable option for earning dignified career.
3. Adapt the dynamic changes happening in the economy to create employment.
4. Prioritize entrepreneurship as life-skills to improve quality of life and skills of

creation to start up.

5. Evaluate opportunities for new creation with overall business Potential and weakness.
6. Develop leadership skill particularly in the area of entrepreneur leadership.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Topics and Subtopics	Hrs.
1. Entrepreneurship Concept and Functions	1.1 Introduction to Entrepreneurship, Entrepreneurship – Concept, Functions and Need 1.2 Entrepreneurship – The Indian Scenario. 1.3 Business Environment and Domain knowledge	04
2. An Entrepreneur & Entrepreneurial Journey	2.1 Development of Entrepreneurial skill and inclination towards entrepreneurship. 2.2 Dimension of Entrepreneurship 2.3 Competencies and characteristics for entrepreneur.	05
3. Entrepreneurs-hip as Innovation and Start up	3.1 Entrepreneurs as problem solvers 3.2 Innovations and Entrepreneurial Ventures – Global and Indian 3.3 Idea generation, Incubation centre.	06
4. Understanding the Market	4.1 Market Concept 4.2 Micro and Macro Market Environment 4.3 Market Research – Concept and Marketing Mix	05
5. Business Finance and Project preparation	5.1 Business plan and project 5.2 Feasibility study of the project 5.3 Project report preparation	06
6. Resource Mobilization	6.1 Institutional Infrastructure to promote entrepreneurship 6.2 Selection and utilization of human resources. 6.3 Business Environment and start up	06

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Outline the success story of any Three entrepreneur from Your Discipline.	1.Entrepreneurship Concept and Functions	02
2	Outline the contribution of SME in GDP of India.	1.Entrepreneurship Concept and Functions	02
3	List out the Barriers faced by entrepreneurship.	1.Entrepreneurship Concept and Functions	02
4	Identify the entrepreneurial traits in students.	1.Entrepreneurship Concept and Functions	04
5	Elaborate the formation of family Business in case study format.	2.An Entrepreneur & Entrepreneurial Journey	02
6	Develop Case study on Technopreneurs like Infosys, UBER, and ZOMATO.	2.An Entrepreneur & Entrepreneurial Journey	06
7	Compose idea generation of new enterprises related to your branch.	3.Entrepreneurship as Innovation and Start up	04
8	Organization of technical feasibility report for the stakeholders and submission for approval.	4.Understanding the Market	04
9	Survey on SSI in your discipline.	5.Business Finance and Project preparation	04
10	List out the facilities and subsidy of SSI unit in your own discipline.	6.Resource Mobilization	02
Total Hrs.			32

❖ **SPECIFICATION TABLE FOR THEORY PAPER: Nil**❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:-Nil**

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	--	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Theory Answer Scripts	1,2,3,4,5,6
				Total	--	--		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course				
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Practical Content	20
2	Entrepreneur Skills Observed	10
3	Result and Conclusion	10
4	Viva Voce	10
	TOTAL	50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1					3	3	3			
2					3	3	3			
3					3	3	3			
4					3	3	3			
5					3	3	3			
6					3	3	3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Entrepreneurship Development and Small Business Management.	Charantimath, P.M.	
2	Entrepreneurship Development in India.	Gupta C.B.	
3	Fundamental of Entrepreneurship and Small Business Management	Himalaya Publishing House.	

❖ E-REFERENCES:

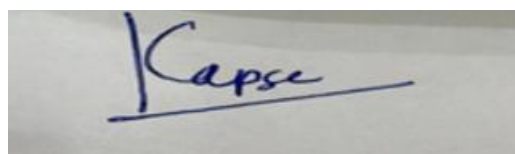
1. Harvard Business Review
2. Business India/Business Today/Business World, University News
3. The Journal of Entrepreneurship by SAGE Publisher.
Journals.sagepub.com/home/joe
4. The journal of Entrepreneurship and Innovation in Emerging Economies by SAGE Publisher,
journals.sagepub.com/home/eie.
5. International journal of Entrepreneurship and small Business by Inderscience Publisher,
www.inderscience.com/ijesb
6. Vikalp Prabandhan

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:

Nil

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1	Dr.C.P.Kapse	In Charge Head of Deptt, Textile Technology	Government Polytechnic, Nagpur.
2	Dr.G.K.Awari	Head of deptt. , Automobile Engg. Deptt.	Government Polytechnic, Nagpur.
3	Dr.K.S.Dixit	Lecturer, Automobile Engg.Deptt.	Government Polytechnic, Nagpur.



(Member Secretary PBOS)
PBOS)

(Chairman

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURE
LEVEL NAME	: CORE COURSE
COURSE CODE	: TX301G^s
COURSE TITLE	: PROCESS CONTROL IN SPINNING
TEACHING SCHEME	: TH: 03; TU:00;PR:02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs(External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

The aim of any production activity is to produce desirable quality at minimum cost. It is imperative to understand scope and role of process control in spinning. This course thoroughly prepares the students to meet the knowledge, skills and attitude required to take on the challenges of day today working of spinning mill.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Evaluate fibre properties to prepare mixing to control quality and cost.
2. Suggest measures to control key process variables at each stage of process.
3. Outline key process variables at ring frame to control yarn quality and faults.
4. Identify steps to improve labour and machine productivity.
5. Prepare chart of implementation of process control programme.
6. Identify energy consumed in each process of yarn manufacture in spinning mill.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hr s.
1 Principles of process control and raw material control	1a. Outline the objectives and scope of process control, & norms for key variables. 1b. Evaluate fibre properties to prepare mixing to control quality and cost. 1c. List records for estimation of yarn realization.	1.1 System for process control, Scope for process control in spinning & Norms and standard. 1.2 Collection and interpretation of data for process control & taking corrective action. 2.1 Control of mixing quality and cost, Evaluation of cotton quality – traditional instruments and HVI and application of HVI to control mixing, Control of mixing through fibre characteristics, FQI. Simultaneous control of mixing cost and quality, cost quality index & Linear Programming for mixing control. 3.1 Yarn Realisation, Definition and Importance. Records for estimating yarn realisation and waste. Norms for yarn realisation.	08
2 Application of Process control in yarn preparatory departments of spinning	2a. Classify key process variables to be controlled at, Blow room, Carding, Draw frame, Comber, Speed frame 2b. Enlist the norms for process key variables at each stage of process 2c. Evaluate key process variables at each stage of process. 2d. Suggest measures to control key process variables at each stage of process.	2.1 Blow room – Methods of measurement, norms and control of: a. Trash content and cleaning efficiency waste losses b. Lap uniformity CV% (within lap and between lap) and lap rejection c. Build of lap & nep generation. 2.2 Card – Methods of measurement, norms and control of: a. Cleaning efficiency, waste, nep & fibre rupture. b. CV% of sliver wrapping and U%. c. Application of AFIS at card. 2.3 Draw frame - Methods of measurement, norms and control of: a. CV% of sliver wrapping sliver U%. b. Sliver breakage rate. 2.4 Comber - Methods of measurement, norms and control of: a. Noil- within comber and between combers. b. Fractionating efficiency of comber & comber stoppage. c. Influence of comber preparatory on comber performance. d. Nep & Sliver uniformity and wrapping.	14

		2.5 Speed Frame - Methods of measurement, norms and control of: a. CV% of roving wrapping. b. U% of roving. c. End breakage rate. d. Roving bobbin defects.	
3. Application of Process control in Ring frame department	3a. Outline key process variables at ring frame to control yarn quality and faults. 3b. State the norms& steps for lea count variations, lea CSP variations, Yarn U%, and hairiness. 3c List remedial measures to control end breakage rate & identify package defects.	3.1 Ring frame - Methods of measurement, norms and control of: CV% of lea count (within and between bobbin variations). 3.2 Yarn strength (lea and single thread). Yarn U%& Yarn imperfections. Random and periodic irregularity (spectrogram analysis). Index of irregularity, length-variance curve & end breakage. 3.3 Yarn and package defects- slubs, crackers, spinners doubles, slough-off, bad piecing, snarls, lapping, and yarn hairiness.	14
4. Measurement and analysis of productivity	4a. Outline machine, labour and efficiency indices of productivity. 4b. Identify steps to improve labour and machine productivity.	4.1 Definition of Indices of productivity And measurement of productivity, Means to improve productivity: 4.2 Maximising efficiency in ring spinning& scope and means for increasing machine productivity in preparatory section.	04
5. Machinery Audit and implementation of process control in cotton spinning	5a Define and describe scope of machinery audit. 5b Prepare chart of implementation of process control programme.	5.1 Machinery audit, Definition and scope & Check list of machinery audit& test instruments for machinery audit. 5.2 Chart of implementation of process control in spinning.	04
6. Energy conservation in spinning	6a. Identify energy consumed in each process of yarn manufacture in spinning mill. 6b. Identify energy conservation applications in spinning mill.	6.1 Energy management in spinning mill. Energy consumption during yarn manufacture& energy efficient technology and conservation in spinning process. 6.2 Use of renewable energy in spinning mill.	04
Total			48

B: LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	a. Prepare mixing wise list of characteristics of cotton with standard norms for mixing. b. Prepare list of HVI parameters for mixing bale management. c. Calculate FQI for various mixings. d. Estimate yarn realization mixing wise	Principles of process control and raw material control	06

2	Evaluate process control parameters in: a. Blow room b. Card c. Draw frame d. Comber e. Speed frame	Application of Process control in yarn preparatory departments of spinning	06
3	a. Identify lea count variation by analysing within and between bobbin lea count variations. b. Determine within and between bobbin lea CSP variations. c. Determine losses in efficiency at ring frame by using snap study technique. d. Determine end breakage rate at ring frame and analyze causes for end breaks. e. Classify and analyze defects and package faults produced at ring frame. f. Analyze idle spindles by taking snap study.	Application of Process control in Ring frame department	08
4	a. Determine losses in efficiency by recording actual production and estimated production in each department and analyze. b. Compare variations in hank meter production of ring frame with doff weight production and analyze the result.	Measurement and analysis of productivity	04
5	a. Prepare machinery audit chart and draw sketch of tools and equipments required for machine audit. b. Prepare process control chart for each process and observe it in each department	Machinery Audit and implementation of process control in cotton spinning	04
6	a. Prepare a chart of energy requirements in each department. b. Calculate kW/kg of yarn produced. c. Prepare a chart of energy efficient measures in spinning department.	Energy conservation in spinning	04
Total Hrs			32

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Principles of process control and raw material control	02(02)	03(00)	06(03)	11(05)
02	Application of Process control in yarn preparatory departments of spinning	02(02)	09(06)	06(03)	17(11)
03	Application of Process control in Ring frame department	02(02)	06(03)	09(06)	17(11)
04	Measurement and analysis of productivity	02(00)	03(00)	00(03)	05(03)
05	Machinery Audit and implementation of process control in cotton spinning	02(00)	00(03)	03(00)	05(03) 4
06	Energy conservation in spinning	02(00)	03(03)	00(00)	05(03)
	Total	12(06)	24(15)	24(15)	60 (36)

SPECIFICATION TABLE FOR THEORY PAPER:

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	2	U	3	2	U	3	2	U	3	2	U	3				3/5
03	2	U	3	3	U	3	3	U	3	3	U	3	5	U	3				3/5
04	4	U	3	6	U	3	5	A	3	4	A	3	6	U	3				3/5
05	1	A	3	1	A	3	3	U	3	1	A	3	2	A	3				3/5
06	2	A	6	3	A	6	3	A	6										2/3

T= Unit/Topic Number L= Level of Question M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6.
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Practical Answer Sheets	1,2,3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1,2,3,4,5,6

				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Procedure	10
2	Process analysis	20
3	Calculation, Result	10
4	Viva voce	10
	TOTAL	50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	3	3	-
CO2	3	3	-	3	-	-	3	3	-
CO3	3	-	-	3	-	-	3	3	-
CO4	3	-	-	3	-	-	3	3	-
CO5	3	3	-	3	2	-	3	3	-

CO6	3	3	-	3	2	-	3	3	-
-----	---	---	---	---	---	---	---	---	---

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Process management in Spinning	R. Senthil Kumar, CRC Press, 2014	9781482208368
2.	Process Control in Spinning	Garde. A. R., Subramania. T. A., Published by Atira, Ahmedabad, India, 1974	
3.	Process Control and Yarn Quality in Spinning	Dr. G Thiagavathi & Dr T Kartik, Woodhead publication, 2015	9789380308357

❖ **E-REFERENCES:**

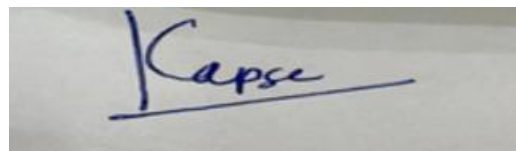
1. https://www.researchgate.net/publication/236107795_Process_Control_in_Drawframe_Comb er_and_Speedframe accessed on 28th August, 2021
2. http://smallb.sidbi.in/sites/default/files/knowledge_base/best_practices/EnergySavingsAudit inTextileIndustry.pdf accessed on 28th August, 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Spinning Laboratory –Speed frame machine, 6 spindle Ring frame

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	HOD Textile Manufactures	Government Polytechnic, Nagpur.



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
COURSE CATEGORY	: CORE COURSE
COURSE CODE	: TX302G^s
COURSE TITLE	: PROCESS CONTROL IN WEAVING
TEACHING SCHEME	: TH: 03; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ RATIONALE:

The students must be aware of various process control program in weaving preparatory & weaving sections. Optimization of process parameters is done based on efficiency of process and required product quality. The students will be able to understand the importance of controls of fabric quality, controls of waste at different machines, control parameters with norms and humidity in weaving process.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Select the process control methodology in weaving.
2. Analyze various parameters using process control in winding.
3. Choose the correct size recipe and processing parameters of sizing process.
4. Use the relevant parameters of healds and reed for drawing-in process.
5. Identify to control the stoppages in loom shed.
6. Examine fabric defects and suggest measures for corrective action.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Principles of process control	1.a Select the process control methodology for given department. 1.b Identify the norms and schedule checks in given department.	1.1 Scope and approach to process control in weaving. Statistical tools and direct control methodology. 1.2 Collection and Interpretation of Data for process control. Establishing norms for Key Variables. Setting norms and schedule of checks and machine audit	06
2 Process Control in Winding	2.a Identify the causes of defects for given package defects. 2.b Analyze various parameters to be controlled in Winding. 2.c Select the relevant process parameter to improve productivity of given winding machine.	2.1 Scope and approach to process control in cone and pirn winding machine. Quality of knots and splice, yarn clearer and their settings, unwinding tension, winding tension, package quality, Causes and Remedies of package defects. 2.2 Assessment of performance of winding machine - quality and productivity , clearing efficiency, classimat classification 2.3 Control the productivity of cone and pirn winding machine. Minimizing the end breaks in cone and pirn winding machine.	08
3. Process Control in Warping & Sizing	3.a Select the processing parameters of warping. 3.b Identify the causes of low productivity. 3.c Choose the correct size recipe and processing parameters of sizing. 3.d Describe the process control parameters to improve the productivity of the	3.1 Warping – scope of process control, control of end breakages, Quality of warping beams, Minimizing end breaks in warping, condition of machine, Causes of low productivity at warping. 3.2 Method of assessing productivity of warping machine & measures to improve the productivity. 3.3 Sizing - scope of process control, choice of sizing recipe and size pick up. Control of size pick up & yarn strength. Control of yarn stretch 3.4 Quality of sized beam, Control of productivity at sizing, Devices for improving weavability of sized yarn.	10

	given machine		
4 Process Control in Drawing-In and warp tying	4a. Use the healds and reed parameters for drawing-in process 4b. Identify the Precautions during drawing-in	4.1 Scope and approach of process control in drawing-in. Selection, care, uses of all types of healds and reeds, care in dressing and knotting, care in drawing in procedure. Drop pins types & uses 4.2 Commonly occurring defects in drawing-in process. Precautions during drawing - in and warp tying process.	06
5 Loom Shed Control	5.a Identify to control the given stoppages due to mechanical faults. 5.b Choose the important factors that affect loom efficiency 5.c Identify the cause of yarn breaks in loom-shed. 5.d Suggest maintenance schedule for given type of loom.	5.1 Scope of process control in loom shed. Limitations on maximum speed , mechanical condition causing reduction in loom speed 5.2 Control of loom speed, efficiency and loom stoppages. Assessment of Loom performance by snap readings. 5.3 Factors affecting loom shed efficiency, warp breakages, weft breakages and mechanical failure. 5.4 Concept of preventive and breakdown maintenance in loom shed. Work activities in preventive maintenance: cleaning, lubrication, inspection.	10
6 Control of Hard Waste and Fabric Quality	6.a Suggest the necessity to control hard waste 6.b Identify hard waste at weaving preparatory and loom shed. 6.c Examine given fabric defects with their causes and remedies.	6.1 Hard waste control - Approach to the reduction of hard-waste and Setting the standards of hard-waste 6.2 Control of hard waste at winding, warping, sizing, pirn winding, drawing and loom shed. 6.3 Grey fabric inspection, Classify fabric defects and type of fabric defects, fabric value loss.	08
Total hours			48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Prepare a list of process control studies with their norms in following department i) Winding ii)warping iii) Sizing iv) loomshed	Principles of process control	04
2	Use the winding machine to prepare winding package	Process Control in Winding	02
3	Observe winding package faults and describe them.		02
4	i) Observe and Record classimat faults of yarn ii) Calculate production and efficiency of winding machine		02
5	Use the warping machine to prepare warpers beam	Process Control in Warping & Sizing	04
6	Observe & record defects at i) warping and ii) Sizing		02
7	Calculate size add-on and size pick up percentages of given yarn		02
8	Calculate production and efficiency of i) warping machine ii) sizing machine		02
9	Observe types of Healds, Reed, Drop pins and describe them.	Process Control in Drawing-in and warp tying	02
10	Determine loom shed efficiency by snap study	Loom Shed Control	02
11	Prepare fabric with given weft colour pattern on loom		04
12	Prepare fabric defects chart and describe them	Control of Hard Waste and Fabric Quality	04
Total Hrs			32

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

R – Remember

U – Understand

A – Analyze / Apply

Unit No.	Units	Levels From Cognition Process Dimension			Total Marks
		R	U	A	
01	Principles of process control	02(00)	03(00)	03(00)	08 (00)
02	Process Control in Winding	02(02)	03(03)	06(03)	11(08)
03	Process Control in Warping & Sizing	02(02)	03(03)	06(03)	11(08)
04	Process Control in Drawing-In and warp tying	02(00)	03(00)	03(03)	08(03)
05	Loom Shed Control	02(02)	03(03)	06(03)	11(08)
06	Control of Hard Waste and Fabric Quality	02(00)	03(03)	06(06)	11(09)
	Total	12(06)	18(12)	30(18)	60(36)

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	2	R	2	3	R	2	5	R	2										
02	1	U	3	1	A	3	2	U	3	2	U	3	2	A	3				3/5
03	2	A	3	2	A	3	3	U	3	3	U	3	3	A	3				3/5
04	4	U	3	4	A	3	4	A	3	5	U	3	5	U	3				3/5
05	5	A	3	6	U	3	6	U	3	6	A	3	6	A	3				3/5
06	3	A	6	5	A	6	6	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

❖ ASSESSMENT AND EVALUATION SCHEME:

	What	To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
--	------	---------	-----------	-----------	-----------	--------------------	-----------------

Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6.
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Practical Answer Sheets	1,2,3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Setting of experiments	10
2	Process analysis	20
3	Calculation and interpretation of the result	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	-	-	3	3	-
CO2	3	3	-	3	-	-	3	3	-
CO3	3	-	-	3	-	-	3	3	-
CO4	3	-	-	3	-	-	3	3	-
CO5	3	3	-	3	2	-	3	3	-
CO6	3	3	-	3	2	-	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Process control in Weaving	M.C Paliwal , P.D.Kimothi Ahmedabad Textile Industry's Research Association, 1974	-
2	Norms for Textiles	Shri T.V. Ratnam, R.Rajamanicham, K.P. Chellamani, D. Shanmuganandan, Ms. Indra Doraiswamy, Dr. Arindam Basu. The South India Textile Research Association Publication ,1980	-

3	Weaving Machine, Mechanisms, Management	Dr.M.K. Talukdar, D.B.Ajagaonkar Mahajan Publication ,Edition I ,2000	9788185401164
4	Norms on Winding, Warping, Drawing in Looms.	Ahmedabad Textile Industry's Research Association Publication,1974	-
5	Weaving: Conversion of yarn to fabric	Lord P.R. and Mohamed M.H. Merrow Publication ,Edition II,1992	9781845692902

❖ **E-REFERENCES:**

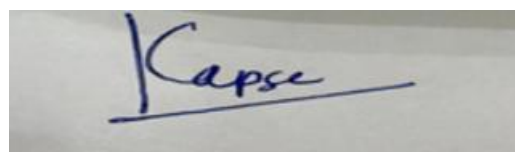
- ❖ <https://archive.nptel.ac.in/courses/116/102/116102019/> assessed on 18th November, 2022
- ❖ <https://archive.nptel.ac.in/courses/116/102/116102005/> assessed on 18th November, 2022
- ❖ <https://textilelearner.net/different-types-of-fabric-faults-causes/> assessed on 18th November, 2022
- ❖ <https://pdfcoffee.com/download/bitra-norms-pdf-free.html> assessed on 18th November, 2022
- ❖ https://www.youtube.com/watch?v=2_FALAUOm2k assessed on 18th November, 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

- ❖ Textile Laboratory –Weaving preparatory and loom shed machine set up, conventional and modern machines.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. S. G. Gaikwad	Lecturer in Textile Engineering	Government Polytechnic, Nagpur.
2.			
3.			
4.			
5.			



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
LEVEL NAME	: PROGRAM CORE COURSE
COURSE CODE	: TX 303G^s
COURSE TITLE	: FABRIC TESTING
TEACHING SCHEME	: TH: 03; TU: 00; PR: 04 (CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT=2 CLOCK HRs)
TH. TEE EXAM	: 03 Hrs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

During the course the knowledge about fabric testing methods, devices and standards is imparted. After learning this course, students would be able to measure property of textile material and analyse for the end use. This is a key course for textile engineering students from testing and quality measurements of the fabric.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Measure the dimensional parameters of fabric.
2. Determine the tensile, tearing and bursting strength of fabric.
3. Examine the serviceability and handle properties of fabric.
4. Relate air and water parameters with fabric property.
5. Select appropriate fastness test for dyed fabric.
6. Conduct garment testing and flammability testing of fabric.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Fabric sampling and Dimensions	1a. Measure the dimensional parameters of given fabric. 1b. Determine the crimp of the yarn in given fabric 1c. Derive cover factor of given fabric.	1.1 Fabric sampling method, Dimensional parameters of fabric- Measurement of fabric length, width, weight, Thickness and thread count. 1.2 Definition of crimp, measurement of warp and weft crimp in fabric by Crimp meter. Influence of crimp on fabric properties. 1.3 Cover factor of fabric and its significance.	08
2. Tensile Testing of Fabrics	2a. Determine the tensile strength of given fabric. 2b. Apply the ballistic principle to measure the tearing strength of given fabric. 2c. Measure the bursting strength of given fabric.	2.1 Fabric Strength Testing- Sample size, working procedure of strip and grab tensile tester. 2.2 Tearing strength testing by Elmendorf tearing strength tester based on Ballistic principle. 2.3 Principle and working of Hydraulic bursting strength tester.	08
3. Measurement of serviceability and Handle properties of Fabrics	3a. Examine the serviceability of given fabric 3b. Measure crease / drape of given fabric. 3c. Determine bending properties of given fabric	3.1 Purpose of serviceability tests- Abrasion and pilling testing of fabrics, factors affecting abrasion resistance and pilling. 3.2 Measurement of crease and drape of fabric 3.5 Definition of fabric stiffness, bending length, flexural rigidity and bending modulus. Measuring fabric stiffness by cantilever principle.	10
4. Comfort properties of Fabrics.	4a. Measure air permeability of given fabric. 4b. Relationship of water and given fabric properties. 4c. Compare different thermal parameters of given fabric.	4.1 Measurement of air permeability properties of fabric and Factors affecting it. 4.2 Relationship of water and fabric properties and its measurements such as Wetting, Drop penetration and Spray Test. 4.3 Definitions of conduction, convection, radiation, Thermal Insulation Value, thermal resistance and CLO.	08
5. Color fastness and fabric shrinkage testing	5a. Select appropriate fastness test for given dyed fabric. 5b. Measure Shrinkage in given fabric	5.1 Outline of fastness properties, sample preparation, Fastness testing of dyed fabric against color fading and staining - Light, Washing, Dry Cleaning, Perspiration, Rubbing and Sublimation 5.2 Fabric shrinkage- Measurement of fabric shrinkage, dimensional stability, swelling effects.	08
6. Seam and flammability testing of fabric.	6a. Justify the need of testing seam properties of given fabric. 6b. Select fabric having flame resistance properties.	6.1 Seam strength and seam slippage of fabric. 6.2 Need and importance of flammability test, 45 degree and vertical strip Flammability test for fabrics, Factors affecting flame proof and flame resistance.	06
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Calculate length, width, weight of given fabric sample by considering sampling technique.	Fabric sampling and Dimensions	04
2	Measure thickness of fabric by thickness tester		04
3	Calculate cover factor of given cloth.		04
4	Measure fabric tensile strength of given fabric sample.	Tensile Testing of Fabrics	04
5	Measure fabric tearing strength of given fabric sample.		04
6	Measure the Stiffness of given fabric sample	Measurement of serviceability and Handle properties of Fabrics	04
7	Measure the drape coefficient of given fabric sample		04
8	Measure the crease recovery of given fabric sample		04
9	Measure the Pilling of given fabric sample		04
10	Perform the wetting test on given fabric sample.	Comfort properties of Fabrics.	04
11	Perform spray rating test on given fabric sample.		04
12	Assess colour fastness to sunlight of a given dyed sample.	Color fastness and fabric shrinkage testing	04
13	Assess colour fastness to rubbing by grey scale of a given fabric sample		04
14	Determine Shrinkage percentage by Launder meter and Template.		04
15	Perform seam strength and seam slippage test on given garment.	Garment testing and flammability testing	04
16	Perform vertical strip flammability test for different textile material.		04
Total Hrs			64

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Fabric sampling and Dimensions	02(02)	06(00)	03(03)	11(05)
02	Tensile Testing of Fabrics	02(02)	03(03)	03(00)	08(05)
03	Measurement of serviceability and Handle properties of Fabrics	02(02)	06(00)	03(06)	11(08)
04	Comfort properties of Fabrics.	02(00)	03(06)	06(03)	11(09)
05	Color fastness and fabric shrinkage testing	02(00)	03(03)	06(03)	11(06) ₃
06	Garment testing and flammability testing	02(00)	03(00)	03(03)	08(03)
	Total	12(06)	24(15)	24 (15)	60 (36)

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

SPECIFICATION TABLE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	1	U	3	2	U	3	2	U	3	5	U	3				3/5
03	3	U	3	3	U	3	4	U	3	4	U	3	4	U	3				3/5
04	5	U	3	6	U	3	1	A	3	1	A	3	4	A	3				3/5
05	2	A	3	3	A	3	6	A	3	5	A	3	6	A	3				3/5
06	5	A	6	4	A	6	3	A	6										2/3

T= Unit/Topic Number L= Level of Question M= Marks

R-Remember U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6.
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	40	--	Practical Answer Scripts	1,2,3,4,5,6
		Journal Writing		Journal Writing	10	--	Journal	1,2,3,4,5,6

				TOTAL	50	20		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Scripts	1,2,3,4, 5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Setting of experiments	10
2	Process analysis	20
3	Calculation and interpretation of the result	10
4	Viva voce	10
	TOTAL	50

7. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	-	3	-	3	3	3
CO2	-	-	3	3	-	-	3	3	3
CO3	3	-	3	-	-	3	3	3	3

CO4	3	2	3	3	3	3	3	3	3
CO5	-	-	3	3	3	-	3	3	3
CO6	3	-	-	3	-	-	-	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

8. REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Textile Testing	P. Angappan, R. Gopalakrishnan Publisher, Edition and Year Of publication	0408705159
2	Principle of Testing	J. E. Booth, Chemical Publishing Corporation; 3rd edition ,1968	10: 0592063259 13: 978-0592063256
3	Hand book of Textile Testing and quality control	Grover and Hamby, Wiley India Pvt Ltd, 2011	9788126531752
4	Watsons Textile Design and colour	Z.J.Grosisci, Woodhead Publishing 1975	978-1-85573-995-6
5.	Physical testing of Textiles	B.P.Saville, Woodhead Publishing 1999	

❖ E-REFERENCES:

1. <https://nptel.ac.in/courses/116/102/116102029/> assessed on 27th Jan , 2022
2. www.itamma.org/ assessed on 27th Jan , 2022
3. www.en.wikipedia.org/wiki/Textile_design
4. <http://www.designdiary.nic.in/> g. <http://textilelearner.blogspot.in>
5. Physical Testing of Textiles by B. P. Saville, 1999, Woodhead Publishing Ltd., U. K
6. Principles of Textile Testing by J. E. Booth, 1961, Heywood Books, London
7. Testing and Quality Management – Edited by V. K. Kothari, IAFL Publications, New Delhi
8. Handbook of Textile Testing and Quality Control by E. B. Grover and D. S. Hamb
9. Websites of textile testing instrument manufacturers, namely Uster, SDL etc.
10. BIS, BS, ASTM and other standard methods of textile testing

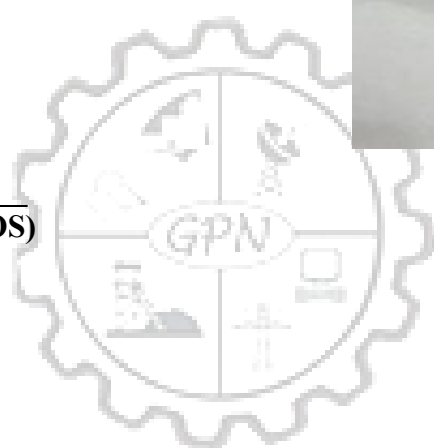
❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

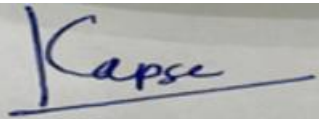
1. Crease recovery tester
2. Crimp tester
3. Pilling Tester
4. Tearing Tester
5. Spray tester
6. Air permeability tester
7. Drape tester
8. Scissors
9. Measuring scales

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	Head of Textile Department	Government Polytechnic, Nagpur.
2.	Dr. S. B. Muttagi	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
3.	Mr. S. G. Gaikwad	Lecturer in Textile Technology	Government Polytechnic, Nagpur
5.	Mrs. L. S. Chakraborty	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
6.	Mr. R. N. Yadav.	Ex President	Mohota Spg and Wvg Mill, Hinganghat, Wardha
7.	Prof. G. S. Kakad	Head of Textile Department	JDIET, Yavatmal
8.	Prof S.S.Lawand	Lecturer in Textile Technology	Government Polytechnic, Solhapur

(Member Secretary PBOS)





(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
COURSE CATEGORY	: CORE COURSE
COURSE CODE	: TX304G\$
COURSE TITLE	: PRODUCTION PLANNING AND ORGANIZATION
TEACHING SCHEME	: TH:03; TU: 01;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

- ❖ This course will provide the knowledge which deals with various important issues facing to manage the Textile Industry. The content related with spin plan, weaving plan, manpower duties and material handling will help Textile students to manage the resources effectively. The planning of machine specification and its implementation will help students to arrange plant layout in detail. The objective of this course is to take appropriate decision and manage the textile industry effectively by textile students.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Select site and building for textile mill.
2. Draw plan for plant and machinery layout of textile mill.
3. Organize machine, hank and production for spinning mill.
4. Prepare weaving organization plan for weaving mill.
5. Choose the optimum manpower required for the spinning and weaving department
6. Identify the safety measures observed in textile mill.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Site Selection and building construction for Textile mills.	1.a Select the site for the given textile mill. 1.b Identify the various aspects of textile mill building. 1.c Describe the need of SEZ and cluster development for textile industry.	1.1 Selection of site for textile mills, Factors influencing site selection. 1.2 Architectural & structural aspects of textile mill building. , Types of factory buildings. Colour schemes for buildings, interior in textile mills. Illumination plan & Humidification plan for textile industry 1.3 General information about SEZ, cluster development and its facility.	06
2. Plant and Machinery layout.	2.a Identify factors Influencing layouts and selection of machinery. 2.b Draw the plant and machinery layout for given textile unit.	2.1 Concept of plant and machinery layout, Types of Plant layout, Factors affecting plant layout. 2.2 Selection criteria for good plant layout. Symptoms of bad layout. Layout aspects of spinning, weaving, knitting and composite mills. Calculation of spatial requirements.	08
3. Organization. Of Spinning Mill	3.a Organise the relevant machine required for the given type of yarn. 3.b Prepare the Hank organization for the given count of yarn.	3.1 Selection of machines & machinery specifications required for the product in spinning. 3.2 Calculation for number of machines in spinning /spin plan Preparation of organization for ring spinning mill and preparatory, departments based on ring spindle capacity and production of ring spun yarn. (Carded, Combed, and Blended).	10
4. Organization of Weaving Mill	4.a Organise the relevant machine required for the product in weaving. 4.b Prepare weave plan and calculate no. of machines in weaving department for different cloths.	4.1 Selection of machines & machinery specifications required for the product in weaving. 4.2 Calculation for number of machines in weaving / weave plan Preparation of organization for shuttle & shuttleless weaving mill and preparatory departments based on number of weaving machines & production of different cloths. Calculation regarding efficiency, waste, crimp, product ion rates, and number of machinery required at	10

		different processes.	
5. Labour Complements in Textiles	5.a Identify the duties of given type of skilled manpower in textile mill. 5.b Choose the workload of worker in given spinning department. 5.c Select the workload of worker in given weaving department. 5.d Describe the concept of given type of study in weaving mill.	5.1 Operative duties of skilled manpower in Spinning and Weaving mills. 5.2 Manpowered required for various spinning department based on workload consideration. 5.3 Manpowered required for various weaving department and based on workload consideration. 5.4 Concept of Work study ,Motion study ,method study, Snap study	08
6. Material Handling and Industrial Safety	1. Describe the need and importance of given material handling equipment in textile mill. 2. Prepare the safety charts for the given department. 3. Identify the causes to reduce fire and safety hazards in given department. 4. Suggest the desirable noise level and control factors in given textile department.	6.1 Importance of material handling and housekeeping. Study of different equipments used for material handling and housekeeping in textile mill 6.3 Concept of Industrial Safety, Safety procedures, Importance and its applications 6.4 Fire safety, Health hazards and precautionary measures. 6.5 Noise - Definition of Noise, Noise control, Desirable noise in different sections of a textile mill	06
Total Hrs.			48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify the various factors considered for site selection.	Site Selection and building construction for Textile mills	2
2	Prepare critical report on salient features of SEZ (Special economic zone) and textile cluster in your area.		2
3	Draw the complete plant layout of spinning mill with machinery dimension on drawing sheet.	Plant and Machinery layout.	4
4	Draw the complete plant layout of weaving unit with machinery dimension on drawing sheet.		4
5	Prepare the spinning organization for carded yarn in spinning mill.	Organization of spinning Mill	2
6	Prepare the spinning organization for combed yarn in spinning mill.		2
7	Prepare the spinning organization for blended polyester/ cotton (67:33) yarn in spinning mill.		2
8	Prepare the weaving organization for cotton shirting fabric on shuttle less weaving machines.	Organization of Weaving Mill	2
9	Prepare the weaving organization for polyester/ viscose suiting fabric on shuttle weaving machines.		2
10	Find out the operative duties in various spinning department.	Labour Complements in Textiles	2
11	Find out the operative duties in various weaving department.		2
12	Identify the safety measures observed in Textile mills.		2
13	Identify the factors of noise reduction in Textile mill.	Material Handling and Industrial Safety	2
14	Draw the material handling equipments of textile mill on drawing sheet.		2
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Site Selection and building construction for Textile mills	02(02)	03(03)	03(00)	08 (05)
02	Plant and Machinery layout.	02(02)	03(00)	06(06)	11(08)
03	Organization of spinning Mill	02(00)	03(03)	06(03)	11(06)
04	Organization of Weaving Mill	02(00)	03(00)	06(03)	11(03)
05	Labour Complements in Textiles	02(02)	03(03)	03(03)	08(08)
06	Material Handling and Industrial Safety	02(00)	03(06)	06(00)	11(06)
	Total	12(06)	18(15)	30(15)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	5	R	2										
02	1	U	3	1	A	3	2	U	3	1	U	3	3	U	3				3/5
03	2	A	3	2	A	3	3	U	3	3	A	3	4	U	3				3/5
04	4	U	3	5	U	3	5	A	3	5	U	3	5	A	3				3/5
05	6	U	3	6	A	3	6	A	3	6	U	3	6	U	3				3/5
06	3	A	6	4	A	6	2	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6.
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Practical Answer Sheets	1,2,3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Setting of experiments	10
2	Process analysis	20
3	Calculation and interpretation of the result	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	3	-	-	-	3	3	-
CO2	3	-	3	-	-	-	3	3	-
CO3	3	2	-	2	-	-	3	3	-
CO4	3	2	-	2	-	-	3	3	-
CO5	3	-	3	-	2	-	3	3	-
CO6	3	-	3	-	2	-	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Management of Textile Industry	<i>Dr. V. D. Dudeja</i>	0408705159
2	Management of Textile Production,	A.Ormorod and N. Butter Wortrs	0408705159
3	Project, Planning Analysis, Selection Implementation & Review by	Prasanna Chandra, Tata McGraw Hill Publishing Co. Ltd.,	0408704586
4	Industrial Organization & Engineering Economics	T.R. Banga & S.C. Sharma, Khanna Publishers, Delhi.	9781855739963/
5	A Weavers' View Can We Afford Not to invest	L. Cegiela M.A, The Textile Institute Publisher	9788182475144
6	Textile Project Management	A Ormerod, The Textile Institute Publication	-

❖ **E-REFERENCES:**

- ❖ <https://archive.nptel.ac.in/courses/116/102/116102019/> assessed on 18th December, 2022
- ❖ <https://archive.nptel.ac.in/courses/116/102/116102005/> assessed on 18th December, 2022
- ❖ <https://www.youtube.com/watch?v=Up1oSSJn6oM> assessed on 18th December, 2022
- ❖ <https://www.youtube.com/watch?v=ZZiDGC8Q1Eg> assessed on 18th December, 2022
- ❖ <http://www.sispa.in/wp-content/uploads/2017/05/SITRA-Norms-for-Spinning-Mills1.pdf> assessed on 18th December, 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. S. G. Gaikwad	Lecturer in Textile Technology	Government Polytechnic, Nagpur.



 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
LEVEL NAME	: PROGRAM CORE COURSE
COURSE CODE	: TX305G
COURSE TITLE	: TECHNICAL TEXTILES
TEACHING SCHEME	: TH: 04; TU:00;PR:00(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT =2 CLOCK HRs.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: NIL
PT. EXAM	: 01 Hr

❖ **RATIONALE:**

Use of innumerable varieties of raw materials, processes, products for their performance and functional properties has resulted into innumerable industrial and technical applications. This programme introduces industrial applications for technical textiles, non-woven fabrics and textile composites in the field of geo textiles, automotive textiles, industrial filtration, human related areas including medical and protective applications.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Explain different segments of Technical Textiles.
2. Define Geo Textile and application.
3. Describe the Medical textiles.
4. Summarize the use of automotive textile with their applications.
5. Describe the applications of textiles in various sports activities.
6. Understand the nonwoven production techniques to manufacture technical textiles.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1 Introduction to Technical Textile	1a. Explain different segments of Technical Textiles. 1b. State the various applications of Technical Textiles. 1c. Describe various fibres used for Technical Textile	1.1 Definition and Classification of Technical Textile. 1.2 Application and development of fibre materials, processes and products in technical textile 1.3 Fibre properties and application in Technical Textile.	06
2 Geo Textiles	2a. Define Geo textiles and its function. 2b. Differentiate between Geo textile and Geo synthetic with their applications. 2c. Relate between natural fibre and synthetic fibre used in Geo Textiles.	2.1 Functional properties of Geo textile: Separation, Drainage, Filtration, Reinforcement 2.2 Characteristics of Geo Textiles: Woven and non-Woven. 2.3 Applications of Geo grids, Geo nets, Geo composite, Geo membranes, Geo Cell, Geo mattress	14
3. Medical Textiles	3a. Illustrate medical requirement of medical textiles. 3b. Describe the Fibre/filaments used in medical textiles. 3c. Describe the application of medical textiles.	3.1 Characteristics of fibre/yarn/fabric used for medical textile. 3.2 Applications: Different application of Medical textile: Implantable textile, Non Implantable textile. 3.3 Extra corporeal devices. Extra corporeal devices. Healthcare and hygiene product.	08
4. Automotive Textiles	4a. Elaborate manufacturing of Automotive Textiles. 4b. Summarize the use of automotive textile with their applications.	4.1 Textiles used in Passenger cars. 4.2 Application of textiles in Heavy Vehicles, Train, Air Crafts, marine and Space technology.	08
5. Sports Textiles	5a. Describe the properties of sports textiles 5b. Describe the applications of textiles in various sports activities.	5.1 Properties of sports textiles. Biomechanics and the engineering aspects of sports machinery, Surface treatment of equipment, 5.2 Applications in sports textiles - Sportswear, footwear, artificial turfs and sleeping bag.	08
6. Non-woven Textiles	6a. Explain the non-woven techniques of fabric manufacturing and process sequence of non-woven 6b. Describe the different web formation methods. 6c. Describe the different bonding methods. 6d. State the application of each type of nonwoven fabric.	6.1 Introduction to Non-woven fabric and Process sequence of non-woven manufacturing 6.2 Methods of web productions- carding machines, air laying, wet laying, Dry laying, spun laying and Melt blown 6.3 Methods of Bonding- thermal, mechanical and chemical methods 6.4 Applications of non-woven fabrics	20

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
NIL			

❖ **SPECIFICATION TABLE FOR THEORY PAPER**

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER**

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	3	R	2	4	R	2	5	R	2										
02	1	U	3	2	U	3	3	U	3	1	U	3	2	U	3				3/5
03	4	U	3	5	U	3	6	U	3	2	U	3	5	U	3				3/5
04	6	U	3	6	U	3	3	A	3	6	U	3	3	A	3				3/5
05	3	A	3	4	A	3	5	A	3	2	A	3	4	A	3				3/5
06	2	A	6	6	A	6	6	A	6										2/3

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Technical Textile	02(00)	03(03)	00(00)	05(03)
02	Geo Textiles	02(00)	03(06)	06(03)	11(09)
03	Medical Textile	02(02)	03(00)	06(03)	11(05)
04	Automotive Textile Fabric	02(02)	03(00)	03(03)	08(05)
05	Sports Textiles	02(02)	03(03)	03(00)	08(05)
06	Non-woven fabrics	02(00)	09(03)	06(06)	17(09)
	Total	12(06)	24(15)	24(15)	60(36)

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1,2,3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1,2,3,4,5,6
				Total	40			
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				TOTAL			--	--

	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
	NIL	

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	1	--	--	--	1	--	3	3	2
2	1	--	--	--	2	--	3	3	2
3	1	--	--	--	3	--	3	3	2
4	1	--	--	--	3	--	3	3	2
5	1	--	--	--	3	--	3	3	2
6	1	--	--	--	3	--	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Non Woven	Moorthhi, P. Madhava and Guruprasad Sundar Shetty Maharaj Publisher Pvt.Ltd. Ahmedabad	ISBN 81- 85401-25-X
2	The Non Wovens	Giovanni, TanchisFondazione ACIMIT	

3	Handbook of Industrial	Sabit Adanur and Wellington Sears, technomic Publishing Company Inc, USA, 1995	
4	NCUTE- Programme on Technical Textile	Khatwani, P.A Yardi, S.S Nodal Centre for Up gradation of Textile Education- IIT-Delhi, February 2-3,2002	
5	Technical Textile Yarns	Alagirusamy and A. Das CRC Press, 2010	
6	The design of textiles for Industrial applications	P.W. Harrison Textile Institute, Manchester, 1998	
7	Specifying Technical textile	Spire The Textile Institute	
8	Production and properties of non woven fabric	Newton, A and Ford, J.E The textile Institute	ISBN-100785572155
9	Non woven	Gulrajani, M.L The Textile Institute	
10	Needle Punching	Purdy, A.T. The Textile Institute ,Manchester	ASBN-0900739320
11	Automotive Textile	Mukhopadhyay, S.K and Partridge, J.F The Textile Institute, Textile Progress, vol 29, No. 1/2	
12	Development in non woven fabrics	Purdy, A.T The Textile Institute	ISBN 0900739622

❖ **E-REFERENCES:**

1. www.india.org
2. <http://technotex.gov.in/>
3. <http://www.technotexindia.in/geotextiles.html/>
4. <http://textilemerchandising.com/classification-of-medical-textile/>
5. <http://textilelearner.blogspot.in/2012/02/geotextiles-properties-of-geotextiles.html>
6. <http://www.slideshare.net/OjasJain/protective-textile-48891331>
7. <http://www.indiantextilejournal.com/articles/FAdetails.asp?id=1207>
8. <http://www.slideshare.net/wakasyounus/textile>
9. <http://www.fibre2fashion.com/industry-article/1807/application-of-textiles-in-automobile>
10. <http://technotexindia.in/transport-textiles.html>
11. <https://textinfo.files.wordpress.com/2011/10/nonwoven-fabrics1.pdf>
12. <http://nptel.ac.in/courses/116102014/>

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

NIL

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. C. P. Kapse	Head of Textile Manufactures Department	Government Polytechnic, Nagpur.
2.	Dr. S.G.Gaikwad	Lecturer in Textile Manufactures Department	Government Polytechnic, Nagpur.
3.	Mrs. L. S. Chakraborty	Lecturer in Textile	Government Polytechnic,

		Manufactures Department	Nagpur
4.	Dr. S. B. Muttagi	Ex. Lecturer in Textile Manufactures Department	Government Polytechnic, Nagpur
5.	Mr. R. N. Yadav.	President	Mohota Spg and Wvg Mill, Hinganghat, Wardha
6.	Dr. G. S. Kakad	Head of Textile Department	JDIET, Yavatmal
7.	Mr. S. S. Lawand	Lecturer in Textile Manufactures Department	Government Polytechnic, Solhapur
8.	Mr.M.N.Gawande	Lecturer in Electrical Engineering department	Government Polytechnic, Nagpur



(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AE/ME/PK/EC/MC/CM/IT/AI/MT/TX/EE
COURSE CATEGORY: HUMANITIES AND SOCIAL SCIENCE COURSE
COURSE CODE : AE213G
COURSE TITLE : INDUSTRIAL MANAGEMENT **
TEACHING SCHEME: TH:03; TU:00;PR:00(CLOCK Hrs.)
TOTAL CREDITS : 03 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEEEXAM : 01 Hr.
PR. TEEEXAM : NIL
PT. EXAM : 30 Minutes (MCQ Based Any 25 out of 30)

❖ **RATIONALE:**

Diploma graduate works at middle management level in the industries / engineering organizations. Therefore he has to be proficient in planning, organizing & coordinating various activities of industries s/ organizations or when he is required to work in different types of projects.

They are also expected to deal with workforce and management problems. In the present era of competition, optimum utilization of the resources with achieving higher productivity is essential for any industry to survive. Quality and cost controls are also other important factors which contribute to the day to day supervision issues. This course aims to deal effectively with such issues along with familiarization of acts and laws applied to industries.

COURSE OUTCOMES:

After completing this course students will be able to

1. Use basic management principles to explore financial resources and management..
2. Use basic management principles to execute dally activities.
3. Use principles of planning and organizing for accomplishment of task .
4. Use principles of directing and controlling for implementing the plans.
5. Apply principles of safety management in all activities.
6. Apply various provisions of Industrial Acts.

❖ **COURSE DETAILS:****A. THEORY :**

Unit	Specific Learning Outcome(SLO) (in cognitive domain)	Topics and Sub-Topics	Hrs.
1. Financial Management	1a. Describe given types of Ownership. 1b. Select suitable forms of ownership for given situations. 1c. Select suitable finance mode for a given venture. 1d. Compare share and debentures on given factors.	1.1 Forms of ownership Proprietorship, Partnership, Joint Stock. 1.2 Co-operative sector public sector Govt. Undertaking Advantages Limitations & Application of each type comparison between different forms 1.3 Need of finance & sources of finance 1.4 Shares, debentures, types of shares, & comparison between shares & debentures, Break even analysis.	10
2. Introduction to Management Concepts and Managerial Skills	2a. Differentiate the concept and principles of management for the given situation. 2b. Describe functions of management for given situation. 2c. Compare the features of the given types of planning 2d. Suggest the steps in organizing in the given situation. 2e. Suggest suitable type of organization for the given example. 2f. Identify the functional areas of management for the given situation. 2g. Suggest suitable managerial skills for given situation with justification .	2.1 Definitions of management, role and importance of management. 2.2 Management characteristics and principles, levels of management and their functions; management, administration and organization, relation between management and administration. 2.3 Functions of management; planning, organizing, leading/directing, staffing and controlling. 2.4 Types of planning and steps in planning 2.5 Types of organization, Steps in organizing 2.6 Functional areas of management. 2.7 Managerial skill : Planning, decision making, problem solving and delegation	10
3.Planning & Organizing	3a. Differentiate the nature of planning and planning activities for the given situation. 3b. Suggest the step wise procedure to complete the given activity in the shop floor. 3c. Select suitable forms for given activities. 3d. Prepare materials and manpower budget for the given production activity. 3e. Describe with block diagrams the organization of the physical resources required for the given situation. 3f. Describe the human needs to satisfy the job needs for the given situation.	Planning at supervisory level 3.1 Planning by supervisor. 3.2 Planning activities, detailing and following of each step. 3.3 Prescribing standard forms for various activities. 3.4 Budgeting for materials and manpower Organizing at supervisory level 3.5 Organizing the physical resources. 3.6 Matching human need with job needs. 3.7 Allotment of tasks to individuals and establishing relationship among persons working in a group	08

	3g. Explain various tasks to be done by the concerned individuals for completing the given activity .		
4. Directing and Controlling	4a. Justify the chosen need of directions and instructions to the subordinates to complete the given task. 4b. Select the feasible of instructions to complete the given simple task, with justification 4c. Predict the possible mistakes for completing the given simple activity. 4d. Describe the managerial control actions and remedial measures required to be taken for completing the given task successfully with justification. 4e. Describe suitable control methods for given factor.	Directing at supervisory level 4.1 Needs for directions and instructions to subordinates; Completeness and feasibilities of instructions. 4.2 Personal counseling advanced predictions of possible mistakes. 4.3 Elaborating decisions, laying disciplinary standards in overall working. Controlling at supervisory level 4.4 Managerial control; understanding team and link between various departments in respect of process and quality standards; Steps in control process. 4.5 Controlling methods; Control over the performance in respect of quality, quantity of production, time and cost. Measuring performance, comparing with standards, correcting unfavorable deviations.	06
5. Safety Management	5a. Describe the general safety norms required to be taken in the given case. 5b. Suggest preventive measures of plant activities in the given situation. 5c. Describe the safe procedural steps required to be taken to prevent the given the type of accident. 5d. Prepare a work permit in to conduct the given maintenance activity. 5e. Describe the causes of the specified type of accident in the given situation. 5f. Prepare the specification of the firefighting equipment required for the given type of fire.	5.1 Need for safety management measures 5.2 General safety norms for an industrial unit; Preventive measures. 5.3 Definition of accident, types of industrial accident, Causes of accidents 5.4 Fire hazards; Fire drill: Procedure and frequency 5.5 Safety procedure: Hazard occupational movement related to process, equipment 5.6 Work permits: Source countries migrants eligibility, age, maximum period of employment	08
6. Legislative Acts	6a. Describe the purpose of the act . 6b. Describe the main provisions of the given acts and important definition.	6.1 Necessity of acts, Important definition and Main provisions of acts. 6.2 Industrial Acts : a. Indian Factory Act b. Industrial Dispute Act c. Workman Compensation Act d. Minimum Wages Act	06
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
NIL			

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1.	Financial Management	02(00)	06(00)	04(02)	12(02)
2.	Introduction to Management Concepts and Managerial Skills	02(00)	04(00)	04(02)	10(02)
3.	Planning & Organising	02(00)	02(02)	06(00)	10(02)
4.	Directing and Controlling	02(00)	04(02)	04(00)	10(02)
5.	Safety Management	02(00)	04(00)	04(00)	10(00)
6.	Legislative Acts	02(00)	02(02)	04(00)	08(02)
	Total	12(00)	22(06)	26(04)	60(10)

R–Remember U–Understand A–Analyze/Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	2	1	U	2	1	U	2	1	U	2	1	A	2	30/35
	1	A	2	1	A	2	2	R	2	2	U	2	2	U	2	
	2	A	2	2	A	2	2	A	2	3	R	2	3	U	2	
	3	U	2	3	A	2	3	A	2	3	A	2	4	R	2	
	4	U	2	4	U	2	4	U	2	4	A	2	4	A	2	
	5	R	2	5	U	2	5	U	2	5	A	2	5	A	2	
	6	R	2	6	U	2	6	U	2	6	A	2	6	A	2	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	--	--	Journal	1, 2, 3,4,5,6
				Total	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	--	--	--	--	3	3	--	--
2	3	--	--	--	--	3	3	--	--
3	3	--	--	--	--	3	3	--	--
4	3	--	--	--	--	3	3	--	--
5	3	--	--	--	--	3	3	--	--
6	3	--	--	--	--	3	3	--	--

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

❖ **REFERENCE & TEXTBOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Industrial Engineering & Management	T.R.Banga&S.C.Sharma,Khanna Publishers, Edition-25, 20142	10:81-7409-078-9 13:978-81-7409-078-9
2.	Industrial Engineering And Management	O.P.Khanna,Dhanpat Rai, New Delhi, 1980	81-885-9777-5
3.	Industrial Organization and Management	Lawrence L Bethel& James L Riggs, New York, McGraw-Hill[1971], 6 th , 1979	09-322-3849-1
4.	Industrial Management	I.K.Chopde&A.M.Sheikh,S.Chand&Co.Ltd, Delhi, 2 nd , 1999	81-219-1480-9
5.	Industrial Engineering: Organization and Management	TaraChand, Publisher: NemChand, 5 th , 1982	B0007BSSB0
6.	Engineering Economics	TaraChand, Publisher: NemChand, 14 th , 2014	81-85240-82-5
7.	Entrepreneurial Development	S.S. Khanna, S. Chand & Co.Ltd, Delhi, 1 st , 1999, reprint 2006	81-219-1801-4

❖ **E-REFERENCES:**

- <http://www.free-management-ebooks.com/index.htm>, accessed on 18th Feb 2022
- https://www.youtube.com/watch?v=3VReVbsmjKI&ab_channel=NPTEL-NOCIITM accessed on 18th Feb 2022
- https://www.youtube.com/watch?v=2Ie9uH9ySpo&ab_channel=ManagementstudyGuide accessed on 18th Feb 2022
- [youtube.com/watch?v=9QM-3LMeBQA](https://www.youtube.com/watch?v=9QM-3LMeBQA) accessed on 18th Feb 2022

❖ **LIST OF MAJOR EQUIPMENTS WITH SPECIFICATION:**❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute/Industry
1.	Dr.G.K.Awari	Head of the Department, Automobile Engineering Deptt.	Government Polytechnic, Nagpur.
2.	Dr.R.G.Choudhary	Head of the Department, Mechanical Engineering Deptt.	Government Polytechnic, Nagpur.
3.	Dr.K.S.Dixit	Sr.Lecturer in Automobile Engineering Deptt.	Government Polytechnic, Nagpur.
4.	Dr.S.A.Telang	Sr.Lecturer in Automobile Engineering Deptt.	Government Polytechnic, Nagpur.



 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/MT/PK/TX/
TR/MC/AIML

COURSE CATEGORY : PROJECT AND INTERNSHIP

COURSE CODE :IN351G

COURSE TITLE :INTERNSHIP

TEACHING SCHEME :TH: 00; TU: 00; PR: 30 (CLOCK Hrs.)

TOTAL CREDITS :15 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCKHR.)

Table: Credit framework for Internship.

Sr. No.	Suggested Schedule	Suggested Duration	Activities	Credits
1.	6 th Semester	16 Weeks	Inter/Intra Institutional activities	15
			Industries/Govt./Non-Govt./NGO/ Rural Internship/Innovation/Entrepreneurship/Research Organizations	
			Seminars/Presentations/Internal Evaluation Work	
			Seminars/Presentations/External Evaluation Work	

TH. TEE : --

PR. TEE : 02 HRs

PT. EXAM : --

❖ **RATIONALE:**

Internship is educational and career development opportunity, providing practical experience in a field or discipline. Industrial training is the demonstration of technical knowledge acquired by the students during their course work. This course provides an opportunity to the students to identify and solve real life problem of the industries / research organizations / society. The main aim of this initiative is enhancement of the employability skills of the students passing out from the institute.

The aim of the polytechnic education is to create a pool of skill based manpower to support shop floor and field operations as a middle level link between technicians and engineers. Diploma pass out plays an important role in managing shop-floor operations. Therefore, it is necessary to the diploma pass out to get acquainted with the actual shop floor operations in the industry. This course has been designed to give actual working environment exposure to the diploma students.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Improve career related skills
2. Adopt industrial safety practices
3. Originate survey, related to industrial processes.
4. Appraise industrial working environment.
5. Elaborate Industrial problems
6. Compile, prepare and present report on activities carried out.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical No.	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Improve Career related activities • Soft Skills • Presentation skills • Career Guidance • Resume Writing skills • Group Discussion skills • Interview skills • Business Etiquette • Effective Email writing • Telephone etiquette • IT Foundation skills • Do's and Don'ts to be followed in Industry • Safety Practices	Orientation / Training	60
2	Adopt Industrial Safety Practices • Talk to safety officer • Record the safety practices to be followed in industry. • Record Don'ts and Do's. • Follow all instructions.	Safety Practices	60
3	Originate survey, related to the Industrial Process • Collect information regarding various processes carried out in an industry by discussing the allotted supervisor/officer • Note down findings • Prepare brief report	Survey	90
4	Appraise industrial working environment • Follow instructions of supervisor • Observe industrial processes • Record daily work done in diary	Working Experiences	120

❖ **SPECIFICATION TABLE FOR THEORY PAPER:** Not Applicable

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:** Not Applicable

❖ ASSESSMENT AND EVALUATION SCHEME:

☐	What		To Who m	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous)	Progressiv e Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignment s		Continuous	--	--	--	--
	TEE (Term End)	End Exam	Stude nts	End of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessmen t of Practical	Students	End of Every week	40	--	Rubrics, Assessme nt Sheets & Report	1,2,3,4,5,6
		Report Writing		Continuous	10	--	Report	1,2,3,4,5,6
		Presentation and Viva- Voce		End of the Course or last two weeks	50	--	Rubrics, Report & Presentatio n	1,2,3,4,5,6
				Total	100	40		
	T E E	End Exam	Stude nts	End of the Course	100	40	Rubrics, Report & Presentati on	1, 2, 3, 4,5,6
	Indirect Assessment	Student Feedback on course		Stude nts	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6
End of Course		End of The Course	Questionnaires					

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Selection of industry	10
2	Survey	10
3	Work done and Feasibility of work/ problem identified	20
4	Report writing	10
5	Presentation Skills and Viva-Voce	50
Total		100

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (POs)							PSOs	
	1	2	3	4	5	6	7	1	2
1	2	-	2	2	3	3	3	3	3
2	2	3	3	3	2	3	3	3	3
3	3	3	3	3	-	2	3	3	3
4	-	2	3	2	-	3	3	3	3
5	2	3	3	2	1	3	3	3	3
6	-	2	2	-	-	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S. N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Industrial Training and Education	Lokesh Choudhary, Mittal Publications, 2007	10: 8183242367 13: 9788183242363
2	Training Practice	Penny Hackett, McGraw-Hill Education, September 2003	10: 0852929803 13: 9780852929803

❖ **E-REFERENCES:**

- <https://learning.tcsionhub.in/courses/career-edge-young-professional/>
- https://www.academia.edu/9360059/INDUSTRIAL_TRAINING_GUIDELINE_BOOK

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

- DLP Projector
- Computers having latest specification

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. M. V. Sarode	Head of Deptt., Computer Engg. Deptt and TPO	Government Polytechnic, Nagpur.
2	Dr. G. V. Gotmare	Lecturer	Government Polytechnic, Gondia.
3	Mr. Avinash Shende	Managing Director (Operation & Planning)	Virtual Galaxy InfoTech Pvt. Ltd. Nagpur
4	Mr. Sachin Pande	Managing Director (Business Development & Management)	Virtual Galaxy InfoTech Pvt. Ltd. Nagpur
5	Mr. Vijay Thakare	CEO	SimSoft Technologies Nagpur

(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN TEXTILE MANUFACTURES
COURSE CATEGORY	: PROJECT AND INTERNSHIP COURSE
COURSE CODE	: TX351G^S
COURSE TITLE	: PROJECT
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04 (CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT =2 CLOCK HR.)
TH. TEE EXAM	: --
PR. TEE EXAM	: 02 HR
PT. EXAM	: --

❖ **RATIONALE:**

The project work is to introduce final year students to professional engineering practices. In project work students are engaged in the analysis, synthesis and application of the courses covered in their studies and to undertake & tackle an independent problem related to Textile Manufactures. This course is very useful for understanding the higher level knowledge in the field of Textile Manufactures.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Carryout market survey /Literature.
2. Select project and Prepare planning.
3. Perform project work independently as a leader and as member of a team.
4. Test project work
5. Prepare project report.
6. Present project report.

❖ **COURSE DETAILS:****A. THEORY :NIL****B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:**

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Perform introductory Task - Form project batch of four-five students - Select project as per area of interest - Select topic / industrial problem / work by consulting the guide from following list 1. Advancement in Textile spinning Technologies. 2. Advanced Weaving Technology 3. Recycling Techniques for Polyester fibres. 4. Technical Textiles 5. Industrial problems 6. Fabrication of proto type model 7. Effects of Weft Density on Fabric hand. 8. Impact of Pre-treatment Processes on dye uptake 9. Effect of weaving parameters on Fabric Aesthetics. 10. Textile waste Management- a comparative study. 11. Nanotechnology in Textile finishing 12. Design parameter 13. Application of Artificial Intelligence in Textile manufacturing. 14. Impact of fiber blends on Fabric strength. 15. Fabrication of working model - Perform Literature Survey - Refer various Periodicals, Journals, Books, - Internet literature related to project topic - Note down findings - Prepare database of collected literature on the basis of title, area of work, methodology used, type of work - Analyze industrial need - Prepare brief report	1. Introductory task and Literature Survey	10
2	Plan project - Prepare Synopsis in standard format which includes following. Title Page: Project Title, Purpose of submission, Institute logo, Students Name, Guide Name, Department and Institute Name - Submit the Synopsis to guide. Approve synopsis from guide	2. Planning	10

	• Prepare action plan of project activities • Submit the action plan to guide • Approve action plan from guide		
3	Perform Project work • Present the overview of the complete system. • Specify design parameters for the system. • Discuss the methodology of the system • Analysis of the work. • Testing of the Process • Calculations • Results and Discussion • Conclusion	3.Project Work	15
4	Test Project work	4. Testing	15
5	Prepare project report in standard format, which includes following. • Title Page which includes: Project Title, Purpose of submission, Institute logo, Students Name, Guide Name, Department and Institute Name • Certificates: Student declaration, Certificate from guide • Acknowledgement • Abstract • Table of contents • List of Tables • List of Figures • List of abbreviations and acronyms (if any) • Text 1. Introduction, objectives 2. Literature Survey 3. Scope of project 4. Methodology/Materials/Methods/Estimate. 5. Detail of Design, working and processes 6. Results and applications 7. Summary/Conclusion and Future scope 8. Appendix(If any). 9. References and Bibliography	5. Project Writing	10

6	Present project work • Prepare power point presentation of work done. • Prepare yourself to handle examiner questions after presentation. • Practice group presentation. • Present before guide	6. Presentation	4
Total Hrs			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER: NIL**

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER : NIL**



❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	Test Answer Scripts	--
		Class Room Assignments		Assignments	--	--	Assignment Book	--
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Theory Answer Scripts	--
				Total	--	--	-	--
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	100	--	Project Diary,Notes, Model, Assembly	1, 2, 3,4,5,6
		Journal Writing		Assignments	--	--	Journal	1, 2, 3,4,5,6
				Total	100	40		
	TEE (Term End Examination)	End Exam	Students	End of the Course	100	40	Project Report, Model, Assembly	1,2,3,4,5,6
	Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6
End of Course Survey		End of The Course	Questionnaires					

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Identification of Topic	10
2	Punctuality and overall contribution	
3	Project Diary	
4	Execution of Project Work	20
5	Project Report including documentation	20
6	Presentation	20
7	Question and Answer	30
	TOTAL	100

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	3	-	-	-	3	3	-	3
2	3	3	-	-	-	3	3	-	3
3	3	-	3	3	3	3	3	2	3
4	3	3	3	3	3	3	3	-	3
5	3	3	-	3	3	3	3	2	3
6	3	-	-	3	3	3	3	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Research Methodology: A Step By Step Guide For Beginners, 4th Edn	Ranjit Kumar, SAGE Publications Pvt. Ltd	9789351501336
2	Successful Project Management: A Step-by-Step Approach with Practical Examples	Milton D. Rosenau, Gregory D. Githens, John Wiley & Sons, Inc, 4th Edition, 2013	13: 9780471680321

❖ **E-REFERENCES:**

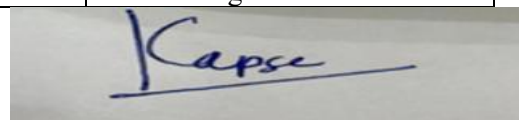
- <https://eduprojecttopics.com/product-category/list-of-textile-project-topics/> accessed on 30th January 22
- <https://sitra.org.in/completed-projects/> accessed on 30th January 22
- <https://www.scribd.com/document/553161436/Annexures> accessed on 30th January 22

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Textile department labs
2. Industry equipment's for testing samples

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. C. P. Kapse	Head of Textile Department	Government Polytechnic, Nagpur.
2	Dr. S. B. Muttagi	Rt. Lecturer in Textile Technology	Government Polytechnic, Nagpur.
3	Dr. S. G. Gaikwad	Lecturer in Textile Technology	Government Polytechnic, Nagpur
4	Mrs. L. S. Chakraborty	Lecturer in Textile Technology	Government Polytechnic, Nagpur.
5	Prof.S.S.Lawnd	MSBTE Representative & Lecturer in Textile Technology	Government Polytechnic, Solhapur
6	Dr. G.S. Kakad	Academic Expert	Head of Textile Department JDIT, Yavatmal
7	Mr. R.N.Yadav	Industry Expert	President ,RSR Mohota Spinning and Weaving Mill



 (Member Secretary PBOS)

 (Chairman PBOS)

Appendix
Suggestive Project Diary Format

Week No.:
Activities Planned:
Activities Executed:
Reason for delay if any
Corrective measures adopted
Remark and signature of the Guide

