Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Textile Technology
Choice Based Credit System (CBCS) in Light of NEP-2020
M. Tech. in Textile Engineering
(2021-2023)
MTTX301 (Elective III)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTX311	DES	NEW FIBRES AND FUNCTIONAL TEXTILES	60	20	20	0	0	3	0	0	3

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objective (CEOs):

1. The course aims to introduce new or highly specialized technological aspects in Fibre science.
2. This course would provide an understanding ofbasic concepts related to the manufacture of high performance and specialty fibres.
3. The course also aims to relate the interdependence of structure, properties and applications of those fibres.

Course Outcomes (Cos):

Students will be able to:

1. Identify and comprehend the properties of new textilefibres accurately.
2. Explain the correct manufacturing process of various new high-performance/ specialty fibres.
3. Comprehend and design products as per the requirement.

Syllabus

UNIT I Introduction to High Performance & Specialty Fibres **10HOURS**

Definition, classification and structural requirements of high performance and speciality fibres. Different characterization Techniques for High performance and speciality fibres: NMR, FTIR, TEM, SEM, insulation, conductivity etc. Polymerization, spinning and properties of aramids, aromatic polyesters, rigid rod and ladderpolymers such as PBZT, PBO, PBI, PIPD.

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MTTX311	DES	NEW FIBRES AND FUNCTIONAL TEXTILES	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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UNIT II High performance and Sustainable Fibres **08 HOURS**

Manufacture of carbonfibres from polyacrylonitrile, viscose and pitch precursors, Conceptof gel spinning and spinning of UHMPE fibres, Elastomeric polymersand fibres, Lyocell fibre production. Sustainable Fibres: Hemp, Banana, Okra, Nettle fibres

UNIT III Speciality Fibres **8HOURS**

Conducting fibres, Thermally and chemically resistant polymers and fibres, Methods of synthesis,production and properties of glass and ceramic fibres.
profile fibres, optical fibres, bi-component fibres and hybrid fibres, Superabsorbent polymers and fibres.

UNIT IV Introduction to Smart Textilesand Coated laminate **09HOURS**

Definition and Classification of Functional and Smart textiles; Introduction to Composites, theory, types, properties. High Performance fibers, thermoplastic and thermosetting Resins; Composite Manufacturing and Applications; Coated and laminated Textiles: materials, formulations, techniques and applications; Protective Textiles-Materials, design, principles and evaluation for protection against fire, harmful radiation, chemicals and pesticides

UNIT V Application of Smart Textiles **10HOURS**

Sportswear: design, testing and materials – fibers, yarns, fabrics for temperature control and moisture management.
Medical textiles: Classification, types and products, Health and Hygiene Textiles-protection against microbes, Wound management- dressings, sutureand bandages, Implants and drug delivery systems.
Smart and Intelligent Textiles: Passive and Active functionality, stimuli sensitivetextiles, Electronic Textiles: wearable computers, flexible electronics.

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MTTX311	DES	NEW FIBRES AND FUNCTIONAL TEXTILES	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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References:

1. V. K. Kothari, Textile fibres: Developments and Innovations, First edition, IAFLpublications,2000
2. Salem David R., Structure Formation in Polymeric Fibres, First edition, HanserPublishers,2000.
3. Ward I M, Developments in Oriented Polymers, Elsevier Applied Science,1987
4. Yang H H, Kevlar aramid fiber, John Wiley & Sons, Chichester, 1993.
5. Mukhopadhyay S K, 'High-performance fibres', Textile Progress, 1993, 25, 1–85.
6. Ozawa S and Matsuda K, High Technology Fibers Part B, edited by Lewin M and Preston J, Marcel Dekker, New York, 1989.
7. Smart Textiles and Their Applications, (1st Ed.), 2016, Koncar, V. (Ed.), eBook ISBN: 9780081005835.
8. Medical and Healthcare Textiles, (1st Ed.), 2010, Anand, S. C., Kennedy, J. F., Miraftab, M., Rajendran, S. (Ed.), eBook ISBN: 9780857090348.
9. Fibrous and Textile Materials for Composite Applications, 2016, Rana, S., Fangueiro, R. (Ed.), eBook ISBN: 978-981-10-0234-2.

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MTTX321	DCS	TECHNICAL TEXTILE	60	20	20	0	0	3	0	0	3

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Course Educational Objective (CEOs):

Student will be able to gain knowledge on basic requirement for technical textile product, manufacturing process and application of technical textiles to extent of their practical use.

Course Outcomes (Cos):

Students will be able to:

1. Understand the requirements for development of technical products.
2. Apply knowledge and analyze to solve the complex problems occur at the time of manufacturing process.
3. Understand the fundamentals of automotive textiles.
4. Illustrate basic knowledge about the filter fabrics.
5. Develop new technical products.

Syllabus

UNIT I

Definition, classification, products, market overview and growth projections of technical textiles. Fibres, yarns and fabric structures in technical textiles and their relevant properties.

UNIT II

Filtration: Textile and other filter media for dry and wet filtration. Mechanisms of separation. Requirements for good filter media and filtration. Fibre and fabric selection for filtration.

UNIT III

Geotextiles: Types and application of geosynthetics. Functions and application areas of geotextiles. Fibres and fabric selection criteria for geotextile applications. Mechanics of reinforcement, filtration and drainage by geotextiles. Soil characteristics. Methods of long term prediction of geotextile life and survivability in soil.

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MTTX321	DCS	TECHNICAL TEXTILE	60	20	20	0	0	3	0	0	3

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UNIT IV

Automotive Textiles: Application of textiles in automobiles. Requirement and design for pneumatic tyres, airbags and belts. Methods of production and properties of textiles used in these applications.

UNIT V

Sewing threads, cords and ropes: Types, method of production and applications. Functional requirements, structure and properties. Miscellaneous: Functional requirements and types of textiles used for paper making, agricultural, architectural, packaging and footwear.

List of References:

1. Technical Textiles - NCUTE Programme Report 2002 - Prof. P.A.Khatwani, S.S.Yardi
2. Guide to Geotextiles Testing - J.N. Mandal, D.G.Divshikar
3. Coated and Laminated Textiles - Walter Fung
4. Advances in Fibre Science - S. K. MukhopadhyayComposite Technologies - Stuart M. Lee
5. Handbook of Fibre Rope Technology - H.A. Mckenna et.al. Textile Inst. Pub.
6. Smart Fibres fabrics and clothing - Xiaoming Tao
7. Fibre and Whisker Reinforce Ceramics for Structural Applications - David Belitskus
8. Mechanics of Textile & Laminated Composites - A.E.Bogdanovich & C.M.Pastore
9. Hand book of nonwovens, S. J. Russell, Woodhead 2007
10. Geosynthetics in civil engineering, R. W. Sarsby, Woodhead 2007
11. Handbook of Technical Textiles, Anand

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MTTX331	DES	TEXTURED YARN TECHNOLOGY	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objective (CEOs):

Student will get the knowledge about the manufacturing process of Textured yarns, bulking process with importance and applications of textured yarn correctly.

Course Outcomes (Cos):

Students will be able to:

1. Explain the core concept of texturing process.
2. Solve the problems occurred during manufacturing of glass textured yarns.
3. Develop the different structure of textured yarns.
4. Analyze the physical and mechanical behavior of Textured yarns.
5. Explain the principle & manufacturing process of air jet textured yarn.

Syllabus

UNIT I Introduction to Texturing — **08 Hours**

Raw material Requirement for texturing of thermoplastics fibres. Theory of deformations and change of energy level. Change in crystallinity and amourphous structure and molecular rearrangement.

UNIT II Types of Texturing — **09 Hours**

Principles of texturing of thermoplastics fibres and modern classification; False twist texturising process- mechanisms and machinery, optimization of texturising parameters, structure-property correlation of textured yarns; knit de knit, edge crimping, stuffer box etc

UNIT III Development of Texturing — **10 Hours**

Draw texturising - the need and fundamental approaches; Friction texturising the need and development, mechanics of friction texturising, latest development in twisting devices, optimization of quality parameters. Noise control in texturising.

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MTTX331	DES	TEXTURED YARN TECHNOLOGY	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

UNIT IV Air Jet Texturising **10 Hours**

Principle, mechanisms, development of jets and machinery, process optimization and characterization, air jet textured spun yarns. Air interlacement - Principle and mechanism, jet development and characterization.

UNIT V Advanced Texturing Method **08 Hours**

Bulked continuous filament yarns - Need, principle, technology development. Hi-bulk yarns - Acrylic Hi-bulk yarn production, mechanism and machines involved, other such products. Solvent and chemical texturising - Need, texturising of synthetic and natural fibres.

References:

1. Yarn Texturing Technology by J.W.S. Hearle, L. Hollick, D.K. Wilson Woodhead Publishing Ltd, England.
2. Textile Yarn, Technology, Structure and Application" – Goswami B.C., Martindale, J.G., Scardino F.L., Wiley Interscience publication, 1977, U.S.A.
3. Wilson D.K. and Kollu T., "Production of Textured Yarns by the False Twist Technique", Textile Progress, Vol. 21, No.3, Textile Institute, Manchester, U.K.,1991.
4. Wilson D.K. and Kollu T., "Production of Textured Yarns by Methods Other than False Twist Technique", Text. Prog., Vol. 16, No.3.Textile Institute, 1981.
5. Gupta V.B. (Edr.), "Winter School on Man-made Fibers – Production, Processing, Structure, Properties and Applications", Vol. 1, 1988.
6. Hes L. Ursiny P., "Yarn Texturing Technology", Eurotex, U.K., 1994.
7. M. Acar and G.R. Wray., "An analysis of the air jet yarn texturing process Part-I: A Brief history of developments in the process", Journal of Text. Institute, Vol.77,No.1, p19-27, (1986).

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MTTX302 (Elective IV)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
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MTTX312	DES	STATISTICAL METHOD AND DESIGN OF EXPERIMENT	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objective (CEOs):

1. To introduce the students with the Fundamentals of the Statistics used in the Textile Technology.

Course Outcomes (Cos):

After the successful completion of this course students will be able to

1. Apply modern probability theory in the Textile Technology.
2. Understand and design the experiment, conduct statistical tests and analyse the results to arrive at the conclusions.
3. Know the fundamental principles of the sample distribution.
4. Study the capability of process and control the process based on data available.
5. Make decisions with minimum error from available data.

Syllabus

UNIT I PROBABILITY DISTRIBUTION AND ESTIMATIONS **Hours 10**

Applications of Binomial, Poisson, normal, t, exponential, chi-square, F and Weibull distributions in textile engineering; point and interval estimations of the parameters of the distribution functions

UNIT II TESTING OF HYPOTHESIS **Hours 10**

Sampling distribution; significance tests applicable to textile parameters – normal test, t-test, chi-square test and F-test; p-Values; selection of sample size and significance levels with relevance to textile applications; acceptance sampling.

UNIT III ANALYSIS OF VARIANCE AND NON-PARAMETRIC TESTS **Hours 08**

Analysis of variance for different models; non-parametric tests - sign test, rank test, concordance test

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MTTX312	DES	STATISTICAL METHOD AND DESIGN OF EXPERIMENT	60	20	20	0	0	3	0	0	3

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UNIT IV PROCESS CONTROL AND CAPABILITY ANALYSIS **Hours 09**

Control charts for variables and attributes - basis, development, interpretation, sensitizing rules, average run length; process capability analysis

UNIT V DESIGN AND ANALYSIS OF EXPERIMENTS **Hours 09**

2 k full-factorial designs; composite designs; robust designs; development of regression models, regression coefficients; adequacy test; process optimizations.

REFERENCES:

1. Montgomery D.C., "Introduction to Statistical Quality Control", John Wiley and Sons, Inc., Singapore, 2002, ISBN: 997151351X.
2. Leaf G.A.V., "Practical Statistics for the Textile Industry, Part I and II", The Textile Institute, Manchester, 1984, ISBN:0900739517.
3. Douglas C. Montgomery, "Design and analysis of experiments", John Wiley & Sons, Inc, Singapore, 2000, ISBN 9971 51 329 3
4. Ronald D. Moen, Thomas W. Nolan, Lloyd P. Provost, "Quality improvement through planned experimentation', McGraw-Hill, 1998, ISBN 0-07-913781-4 14

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTX322	DES	ADVANCED SPINNING PROCESS	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objective (CEOs):

Students will get introduced with the theory of yarn formation by rotor spinning, friction spinning, air-jet spinning and other spinning systems with the extent of process parameters and quality of yarn.

Course Outcomes (Cos):

Students will be able to:

1. Apply knowledge for the manufacturing Process of various advanced yarns.
2. Solve the complex technical problem in manufacturing of advanced yarn.
3. Identify and analyze the structural difference of advanced yarn.
4. Design the automation required in the machineries.

Syllabus

UNIT I Open end Spinning **08 Hours**

Principle of open end spinning; description of the working of the rotor spinning; requirements of the raw materials; preparation of the sliver for rotor spinning; yarn formation and its structure; yarn withdrawal and winding; design of rotor, opening roller, transport tube, navel and their implications on production and yarn quality; developments in rotor spinning machine; production limits; process control; techno economic comparison with ring spinning.

UNIT II DREF Spinning **08 Hours**

Principle of yarn formation - DREF-2, DREF-3 spinning systems; developments in friction spinning systems; raw material requirement; effect of process variables on yarn quality; application of these machines for different end products; the economics; technological limitations.

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MTTX322	DES	ADVANCED SPINNING PROCESS	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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UNIT III Air Jet Spinning **09 Hours**

Description of the yarn production in air jet spinning machine; feasibility of higher draft applied in this machine; structure and quality of the air-jet spun yarn; raw materials requirement; process variables; production of by Airvortex system.

UNIT IV New Spinning **10 Hours**

Production of yarn in PLYfil, parafil, disc spinning, rubbing technique recpo, electrostatic, working details of the production of double-rove yarns, wrap yarns and core spun yarns; compact yarn, use of raw materials; economics of these methods of yarn production; yarn characteristics and their applications.

UNIT V Composite Spinning **09 Hours**

Adhesive spinning system, mechanism of twist-less spinning, take-ja process, pavena process Bobtex spinning systems; properties of such yarn, their usefulness and applications.

List of References:

1. Oxtoby E., "Spun Yarn Technology", Butterworths, London, 1987.
2. Klein W., "New Spinning Methods ", The Textile Institute, Manchester, 1993.
3. Dyson E., "Rotor Spinning, Technical and Economics Aspects ", Textile Trade Press, New Mills, Stock Port, 1975.
4. Salhotra K.R. and Ishtiaque S.M., " Rotor Spinning; its advantages ", Limitations and Prospects in India, ATIRA, Ahmedabad, 1995.
5. Lord P.R, " Yarn Production; Science, Technology and Economics ", The Textile Institute,Manchester, 1999.
6. Trommer G., "Rotor Spinning", Meliand Textilebenchte GmbH, Rohrbacher, 1995.
7. Lawerence C.A and Chen K.Z., "Rotor Spinning ", Textile Progress, The Textile Institute, Manchester, 1984.
8. Lawrence C. A., "Advances in yarn spinning technology" Wood head publishing, 2010, ISBN-13: 978 1 84569 444 9.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
MTTX332	DES	Chemical Processing of Textiles	60	20	20	0	0	3	0	0	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To build an understanding about various pretreatment processes on textile materials
2. To impart knowledge about various dyeing processes of textile materials

Course Outcomes (COs)

Students will be able to

1. Select and apply various chemicals for preparation of various textile materials
2. Choose the dyes and make recipe for dyeing of different textile materials
3. Evaluate fastness properties of dyed textile materials.

Syllabus:

Unit I: Preparatory processes of dyeing **10 Hours**

Introduction, Singeing, Desizing, Scouring, Bleaching, Hypochlorite, peroxide and chlorite bleaching, Continuous scouring and bleaching, Mercerization, Heat setting, Optical brightening agents, Copper number, cuprammonium fluidity, Whiteness index, Barium activity number, Pretreatment range

Unit II: Dyeing theory **08 Hours**

Properties of dye and pigments, Colour and chemical constitution: Chromophore, auxochrome and solubilising groups, Colour measuring instrument, Classification of dye according to chemical constitution and according to application, Dyeing process: Adsorption of dye, absorption of dye, fixation of dye, Fastness requirement: Light fastness, washing fastness, rubbing fastness, perspiration fastness, sublimation fastness, dry cleaning fastness, dry heat fastness.

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M. Tech. in Textile Engineering
(2021-2023)
MTTX302 (Elective IV)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
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MTTX332	DES	Chemical Processing of Textiles	60	20	20	0	0	3	0	0	3

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Unit III: Dyeing of textile materials **08 Hours**

Introduction, Direct dye, Reactive dye: Monofunctional and bifunctional reactive dyes, dichlorotriazinyl, monochlorotriazinyl and vinyl sulphone type reactive dye, vat dye: indigoid and anthraquinonoid vat dye, Reduction and oxidation processes, sulphur dye, acid dye: leveling, milling and supermilling acid dye, metal complex dye, azoic dye: napthol, base, diazotization, coupling, disperse dye: carrier, HTHP and Thermosol dyeing methods .

Unit IV: Printing of textile materials **10 Hours**

Introduction, Different methods of printing, Different styles of printing, dyes and pigments used in printing, Various ingredients used in printing: Binder, thickener, acid, alkali, oxidizing agent, reducing agent, After treatments of printed materials, Printing machines: Roller printing machine, flat bed screen printing machine, rotary screen printing machine, transfer printing machine, polymeriser machine

Unit V: Finishing of textile materials **09 Hours**

Introduction, mechanical and chemical finishes, calendaring, raising, shearing, anti-shrink finishing, crease resistant finishing, softener, water repellent finishing, flame retardant finishing, silicon finishing, machines used in finishing: padding mangle, stenter, sanforizing machine, calendaring machine, drying ranges, Discharge of hazardous materials, RSL restricted substance list.

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MTTX332	DES	Chemical Processing of Textiles	60	20	20	0	0	3	0	0	3

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References:

1. Handbook of textile and industrial dyeing; M. Clerk(Editor); Woodhead publishers, 2011
2. Cellulosic Dyeing; John Shore; Bradford : Society of Dyers and Colourists, 1995
3. Textile Preparation and Dyeing; Asim Kumar Roy Choudhury, Science publishers, 2006
4. Chemical Technology in the Pre-treatment Process of Textiles -. Karmakar S. R.,Elsevier sciences B.V.,1999
5. Technology of Bleaching and Mercerizing; V.A. Shenai, Sevak Publications Mumbai, 1991.
6. Technology of Dyeing; V. A. Shenai, Sevak Publications, Mumbai, 1996
7. Textile Printing; Leslie W.C. Miles, Society of Dyers and Colourists, UK, 2003
8. Chemical finishing of Textiles; W D Schindler, P J Hauser, Woodhead publishing, 2004

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MTTX303	CDS	DISSERTATION (PART - I)	0	0	0	240	160	0	0	20	10

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Course Educational Objectives (CEOs):

1. Course will exposed the students to the method of the starting the research work through literature review and analysis of a particular problem.
2. Course will provide the students about the latest instrument and machinery in the institute lab, various research lab and industry..

Course Outcomes (COs):

Students will be able:

1. Apply the knowledge to study a particular problem
2. Analyze and solve the problem coming during their research work.
3. To create a aptitude for a research work

Course Contents:

Each student will work in the institute lab / outside research / industry institute to study and conduct their research work.

The student may work thoroughly on the literature review and try to understand the problem

The student may start their project work to a particular project under the guidance of the faulty guide allotted to them.

Each student has to give three power point presentations during the semester in front of the senior faculty members and research scholars.

At the end of the semester each student will be required to submit a report of their work done during the semester which will be assessed by their guide for the internal valuation. The students are also required to appear in the end semester examination.

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