Forest Biomaterials (FB)

FB 476/PSE 476/FB 576/PSE 576 Environmental Life Cycle Analysis (3 credit hours)
Overview of the various aspects of conducting and interpreting an environmental life cycle analysis on a product or service. Students will learn how to construct a life cycle analysis goal and scope, inventory, assessment and interpretation. Skills in the critique and communication of a life cycle analysis will be developed. Includes an overview of the following life cycle stages: raw materials, energy, transportation, production, use, and end of life. Emphasis on systems thinking. Targeted for students in any science or engineering program. Credit not allowed for both PSE 476 and WPS 576.

GEP Interdisciplinary Perspectives
Typically offered in Fall only

FB 480/FB 580 The Sustainable Bioeconomy (3 credit hours)
The Sustainable Bioeconomy course examines the current and future opportunities and challenges of bioproducts and bioenergy in society. This course explores relationships between society's economic demand for inexpensive energy and products and our responsibility to produce these products in environmentally and socially responsible ways. Students explore a range of bioproduct categories including biofuels, virgin and recycled paper and wood products, and advanced biomaterials. A panel of instructors from multiple disciplines and bioeconomy stakeholders will share their diverse perspectives and experiences in the bioeconomy. Students will learn about careers available in the growing bioeconomy sector and the knowledge and skills necessary for these jobs. This course is intended for students who are declared in a STEM major at an accredited institution.

GEP Interdisciplinary Perspectives
Typically offered in Fall only

FB 501 Masters Research Methods in Forest Biomaterials (2 credit hours)
This course is an introduction to research methods for MS students in the Forest Biomaterials Department. It will cover conduct of research by the scientific method, literature searching, rules for assigning credit for the work of others, basic research ethics, common laboratory practices including safety and etiquette, mentoring, experimental design, basic statistics, and analysis of data. Students will review research papers, write research papers with proper sections, and present research at the masters level. Credit is not allowed for both WPS 501 and 701.

Typically offered in Fall only

FB 504 Physical and Mechanical Properties of wood (3 credit hours)
Concepts involving the interaction of wood with moisture and heat and the mechanical behavior of solid wood based materials are discussed. Students develop skills in characterization of psychrometric processes in the wood industry, formulation of solutions to moisture related wood problems, the analysis of thermal processes for wood, solving stress-strain problems in load bearing wood structures, and methods to characterize wood properties. An undergraduate degree in engineering or science is required. For related undergraduate degrees, the student must get approval from the instructor to enroll.

Typically offered in Spring only
This course is offered alternate odd years

FB 510 Strategic Business Processes for the Forest Products Industry (3 credit hours)
Strategic Business Processes is designed to introduce the technically trained student to organizational, management and leadership processes that drive a successful business. The course highlights the differences between principled leadership and "opinion poll" leadership, the need to balance the conflicting wants of major stakeholders in the business, the importance of a unique strategy, the linkage between strategy and day-to-day implementation of the strategy and the ingredients and requirements for a successful career. Real time illustrations are based on the Forest Products industry.

Typically offered in Fall only

FB 516 Forest Products Colloids & Surfaces (3 credit hours)
Surface and interfacial science as related to uses of lignocellulosic materials are covered. Fundamentals of the physical chemistry of surfaces and aqueous suspensions are brought to life with examples from such fields as paper science, biomaterials science, composites, and cellulosic liquid fuels technology. Topics include colloidal stability, flocculation, surface forces, polyelectrolyte behavior, electrokinetics, capillary forces, adhesion, surfactancy, and self-assembly. Water-cellulose interactions, including wettability, swelling, and hydrogen bonding effects will be highlighted.

Typically offered in Spring only
This course is offered alternate even years

FB 522 Chemical Principles for the Papermaking Process Engineer (3 credit hours)
Chemical principles for the Papermaking Process Engineer provides a foundation in aqueous chemistry and the applications of polyelectrolytes. The course is intended for professionals employed in the paper manufacturing industry and related industries, such as chemicals suppliers to paper manufacturers. Topics include the papermaking process, acids and bases, polymers, water-resistance, paper strength, colorants, retention and dewatering aids, deposit control, coatings, recycling, and wastewater treatment. Lectures are by CD or DVD. The course-pack, quizzes, and readings are on the web. For off-campus students. Permission of instructor required.

Prerequisite: One year of chemistry courses.
Typically offered in Fall only

FB 527 Wet-End and Colloidal Chemistry (3 credit hours)
The course objective is to prepare students to solve problems related to chemical usage on paper machines. Subjects include paper machine operations, fibers, fillers, chemistry of additives, colloids, control of paper's interactions with liquids, strength, dyes,strategies to optimize retention, dewatering strategies, strategies to achieve more uniform paper, strategies to improve production rates, and wet-end chemical process control.

Prerequisite: Graduate standing
Typically offered in Fall only

FB 528/CE 528 Structural Design in Wood (3 credit hours)
Behavior, strength and design of wood structural members subjected to moment, shear and axial forces. Design of connections and introduction to design of wood structural systems.

Prerequisite: C- or better in CE 325
Typically offered in Spring only

FB 565 Forest Biomaterials Physics (3 credit hours)
Physical models of forest biomaterials including (1) viscosity properties of biopolymer solutions and fibrous suspensions, (2) visco-elastic and thermal properties of biopolymers, (3) elastic properties of biomaterials, and (4) fibrous network properties are covered. Focus is on the scientific aspects of these topics with special applications to materials derived from forest resources.

Typically offered in Spring only

FB 576/PSE 576/FB 476/PSE 476 Environmental Life Cycle Analysis (3 credit hours)
Overview of the various aspects of conducting and interpreting an environmental life cycle analysis on a product or service. Students will learn how to construct a life cycle analysis goal and scope, inventory, assessment and interpretation. Skills in the critique and communication of a life cycle analysis will be developed. Includes an overview of the following life cycle stages: raw materials, energy, transportation, production, use, and end of life. Emphasis on systems thinking. Targeted for students in any science or engineering program. Credit not allowed for both PSE 476 and WPS 576.

GEP Interdisciplinary Perspectives
Typically offered in Fall only

FB 580/FB 480 The Sustainable Bioeconomy (3 credit hours)
The Sustainable Bioeconomy course examines the current and future opportunities and challenges of bioproducts and bioenergy in society. This course explores relationships between society's economic demand for inexpensive energy and products and our responsibility to produce these products in environmentally and socially responsible ways. Students explore a range of bioproduct categories including biofuels, virgin and recycled paper and wood products, and advanced biomaterials. A panel of instructors from multiple disciplines and bioeconomy stakeholders will share their diverse perspectives and experiences in the bioeconomy. Students will learn about careers available in the growing bioeconomy sector and the knowledge and skills necessary for these jobs. This course is intended for students who are declared in a STEM major at an accredited institution.

GEP Interdisciplinary Perspectives
Typically offered in Fall only

FB 595 Special Topics Wood and Paper Science (1-6 credit hours)
Typically offered in Fall and Spring

FB 601 Master's Seminar (1 credit hours)
Weekly seminar in which students registered for course present the results of research and special projects and faculty and guest speakers present state of the art research areas of the profession. Invitation to all graduate students and faculty in department to attend and join discussion. Each student pursuing a Master degree expected to take this offering once for one hour of credit.

Prerequisite: Senior standing or Graduate standing
Typically offered in Fall and Spring

FB 620 Wood and Paper Science Problems (1-3 credit hours)
Assigned or selected problems in the field of wood, paper and pulp science and technology.Credits Arranged

Prerequisite: Senior standing or Graduate standing
Typically offered in Fall, Spring, and Summer

FB 625 Advanced Wood and Paper Science Problems (1-6 credit hours)
Selected problems in the field of wood and paper science.Credits Arranged

Prerequisite: Graduate standing
Typically offered in Fall and Spring

FB 685 Master's Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment, and evaluate the student upon completion of the assignment.

Prerequisite: Master's student
Typically offered in Fall only

FB 688 Non-Thesis Masters Continuous Registration - Half Time Registration (1 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain half-time continuous registration to complete incomplete grades, projects, final master's exam, etc.

Prerequisite: Master's student
Typically offered in Summer only

FB 689 Non-Thesis Master Continuous Registration - Full Time Registration (3 credit hours)
For students in non-thesis master's programs who have completed all credit hour requirements for their degree but need to maintain full-time continuous registration to complete incomplete grades, projects, final master's exam, etc. Students may register for this course a maximum of one semester.

Prerequisite: Master's student
Typically offered in Fall and Spring

FB 690 Master's Examination (1-9 credit hours)
For students in non thesis master's programs who have completed all other requirements of the degree except preparing for and taking the final master's exam.

Prerequisite: Master's student
Typically offered in Fall and Summer

FB 693 Master's Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Master's student
Typically offered in Fall and Spring

FB 695 Master Thesis Research (1-9 credit hours)
Thesis research.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

FB 696 Summer Thesis Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Master's student
Typically offered in Summer only

FB 699 Master's Thesis Preparation (1-9 credit hours)
For students who have completed all credit hour requirements and full-time enrollment for the master's degree and are writing and defending their theses.

Prerequisite: Master's student
Typically offered in Fall, Spring, and Summer

FB 701 PhD Research Methods in Forest Biomaterials (2 credit hours)
This course is an advanced research methods course for PhD students in the Forest Biomaterials Department. It will cover conduct of research by the scientific method, literature searching, rules for assigning credit for the work of others, basic research ethics, common laboratory practices including safety and etiquette, mentoring, experimental design, basic statistics, and analysis of data. Students will review research papers, write research papers with proper sections, and present research at the doctoral level. Credit is not allowed for both WPS 501 and 701.

Typically offered in Fall only

FB 723 Forest Biomaterials Chemistry (3 credit hours)
Chemical reactivity, structure and functional background of forest-derived polymers relative to paper science and biomaterials/bioenergy are covered. An understanding for the relationships between a material's structure and its properties will be developed with respect to applications. Course includes a basics of polymers, biomacromolecules (carbohydrates and lignin), pulping and bleaching chemistry, new technologies and environmental issues.

Typically offered in Spring only
This course is offered alternate odd years

FB 740 Wood Composites (3 credit hours)
Course designed to acquaint advanced undergraduate and graduate students with rapidly expanding field of wood composites. Presentation of production processes for particle board, plywood, hardboard, fiberboard, and other wood composites. Developmentof elastic theory for the stiffness, strength and buckling resistance of composites. Test procedures for determining mechanical properties and design procedures for glued laminated members, panel products, and built-up members, including I- and box-beams, stressed-skin panels and sandwich panels, outlined.

Prerequisite: WPS 441, Graduate standing or Advanced Undergraduate standing
Typically offered in Spring only
This course is offered alternate years

FB 760 Engineering Unit Operations for Biomass Conversion (3 credit hours)
Engineering fundamentals and process technology for the production of biomaterials including paper and bioenergy are covered. These will include heat transfer, chemical kinetics, fluid mechanics, and thermodynamics. Applications include a) process technology for the production of paper b) heat and material balances in a pulping and papermaking c) process technologies for the production of bioenergy d) design of bioreactors e) recovery and purification of products f) gasification and pyrolysis reactions and g) catalytic conversion of syngas.

Typically offered in Spring only

FB 795 Advanced Special Topics (1-6 credit hours)

FB 801 Doctoral Seminar (1 credit hours)
Weekly seminar in which students registered for course present the results of research and special projects and faculty and guest speakers present state of the art research areas of the profession. Invitation to all graduate students and faculty in department to attend and join discussion. Each student pursuing a Doctoral degree expected to take this offering twice for one hour of credit each time.

Typically offered in Fall and Spring

FB 820 Special Problems (1-6 credit hours)
Assigned or selected problems in the field of wood, paper and pulp science and technology.

Prerequisite: Senior standing or Graduate standing
Typically offered in Fall and Spring

FB 825 Advanced Wood and Paper Science Problems (1-9 credit hours)
Selected problems in the field of wood and paper science.

Prerequisite: Graduate standing
Typically offered in Fall and Spring

FB 885 Doctoral Supervised Teaching (1-3 credit hours)
Teaching experience under the mentorship of faculty who assist the student in planning for the teaching assignment, observe and provide feedback to the student during the teaching assignment and evaluate the student upon completion of the assignment.

Prerequisite: Doctoral student
Typically offered in Fall only

FB 890 Doctoral Preliminary Examination (1-9 credit hours)
For students who are preparing for and taking written and/or oral preliminary exams.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

FB 893 Doctoral Supervised Research (1-9 credit hours)
Instruction in research and research under the mentorship of a member of the Graduate Faculty.

Prerequisite: Doctoral student
Typically offered in Fall and Spring

FB 895 Doctoral Dissertation Research (1-9 credit hours)
Dissertation research.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer

FB 896 Summer Dissertation Research (1 credit hours)
For graduate students whose programs of work specify no formal course work during a summer session and who will be devoting full time to thesis research.

Prerequisite: Doctoral student
Typically offered in Summer only

FB 899 Doctoral Dissertation Preparation (1-9 credit hours)
For students who have completed all credit hour, full-time enrollment, preliminary examination, and residency requirements for the doctoral degree, and are writing and defending their dissertations.

Prerequisite: Doctoral student
Typically offered in Fall, Spring, and Summer