

STATE COUNCIL OF HIGHER EDUCATION FOR VIRGINIA

PROGRAM PROPOSAL COVER SHEET

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|---|---|
| <p>1. Institution: Virginia Polytechnic Institute and State University</p> | <p>2. Program action (Check one): New program proposal <input checked="" type="checkbox"/> <u>x</u> Spin-off proposal _____ Certificate proposal _____</p> |
| <p>3. Title of proposed program: Packaging Systems and Design</p> | <p>4. CIP code: 15.1503</p> |
| <p>5. Degree designation: Bachelor of Science</p> | <p>6. Term and year of initiation: Fall 2013</p> |
| <p>7a. For a proposed spin-off, title and degree designation of existing degree program 7b. CIP code (existing program) Not applicable</p> | |
| <p>8. Term and year of first graduates: May 2014</p> | <p>9. Date approved by Board of Visitors</p> |
| <p>10. For community colleges: date approved by local board date approved by State Board for Community Colleges Not applicable</p> | |
| <p>11. If collaborative or joint program, identify collaborating institution(s) and attach letter(s) of intent/support from corresponding chief academic officers(s) Not applicable</p> | |
| <p>12. Location of program within institution (complete for every level, as appropriate). Departments(s) or division of <u>Department of Sustainable Biomaterials</u> School(s) or college(s) of <u>College of Natural Resources and Environment</u> Campus(es) or off-campus site(s) <u>Virginia Tech Blacksburg VA</u> Distance Delivery (web-based, satellite, etc.) _____ Not applicable</p> | |
| <p>13. Name, title, telephone number, and e-mail address of person(s) other than the institution's chief academic officer who may be contacted by or may be expected to contact Council staff regarding this program proposal. Dr. Barry Goodell, Department Head – Dept. of Sustainable Biomaterials, 540-231-8853, goodell@vt.edu Dr. Laszlo Horvath, Asst Prof. of Practice, Dept of Sustainable Biomaterials, 540-231-7673, laszlo_horvath@vt.edu Dr. Robin Panneton, Director, Office of Degree Management, 540-231-9770, panneton@vt.edu</p> | |

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I. DESCRIPTION OF THE PROPOSED PROGRAM

Overview

The Department of Sustainable Biomaterials at Virginia Tech requests approval for a new Bachelor of Science degree in *Packaging Systems and Design*, to begin in the fall semester of 2013. It is anticipated that the *Packaging Systems and Design* degree will meet a growing demand for education in the area of packaging science being driven both by societal needs for environmentally sound packaging and industry growth. Packaging is currently the third-largest industry in the United States and the need for well-educated graduates is particularly strong in states like Virginia that serve as transportation crossroads.

Packaging is an essential component of industrialized economies. The B.S. program in Packaging Systems and Design prepares students for careers in industries producing and utilizing packaging materials of all types. Graduates from the program would serve regional, national and global community needs, as well as a multibillion dollar industry. Packaging is an essential part of industrialized economies; protecting, preserving and facilitating the transport of products while aiding marketing.

Packaging is a rapidly growing industry with a \$420 billion global market (Datamonitor 2010a). The size of the industry alone means that our graduates will have many opportunities for employment. Further, they can find employment in diverse areas of the field, including the sub-fields of packaging materials and machinery manufacturing (e.g., synthetic and natural polymer, paper and paperboard, glass and metal packaging material, and packaging equipment manufacturing industry), packaging-related consumer industries (e.g., food, pharmaceutical/nutraceutical, cosmetics, electronics, and automobile manufacturing), service and marketing (e.g., distribution/warehouse and transportation industry), industrial graphic design (e.g., printing, labeling and packaging graphic designs), and academic and federal agencies for research, education and legislation (e.g., the Food & Drug Administration and the United States Department of Agriculture). The latter agencies are more numerous in Virginia because of the Commonwealth's central coastal location, as well as its' proximity to Washington, DC. It is expected that graduates from this program will have very good employment opportunities within the Commonwealth, but in addition, there will be an abundance of opportunities should graduates choose to take positions in other states. Global leadership from our graduates is also expected, and in an international field such as packaging we would expect our graduates to be sought out at this level.

Graduates from our program will be in high demand and will be prepared to grow and adapt as changes occur within the field. Leading packaging companies (e.g., International Paper, Amcor, and Tetra Laval) have placed significant emphasis on sustainability issues and the ability of their products and production systems to comply with consumer demand for sustainable packaging (Datamonitor, 2010b). This aspect of the field is anticipated to be of even greater importance in the future, and our program in the Department of Sustainable Biomaterials is ideally suited to educate students in this area.

The proposed program supports the missions of the Department of Sustainable Biomaterials in the College of Natural Resources and Environment, and Virginia Tech as a public land-grant university serving the Commonwealth of Virginia, the nation, and the world community. Through the discovery and dissemination of new knowledge, Virginia Tech's Vision and Mission (http://www.president.vt.edu/mission_vision/mission.html) focus on the creation, conveyance, and application of knowledge to improve the quality of life for our populace. In that spirit, the *Packaging Systems and Design* degree program in the Department of Sustainable Biomaterials will strive to embody VT's mission as it invents the future of the packaging world, providing a creative environment to grow educational and public service programming that will lead to a higher quality of life both within and beyond the Commonwealth.

The vision and the goals of the proposed *Packaging Systems and Design* degree also are closely matched to those of the College of Natural Resources and Environment. Our students will be trained to take on roles as international leaders in the field of environmental and natural resource science. Only five other states in the nation offer a B.S. Packaging Science degree or option, and the proposed degree at Virginia Tech will allow us to fill a role in education that extends beyond the borders of the Commonwealth. The degree program will produce not only well-trained professionals, but also foster continued research, public service and outreach activities consistent with the goals of the College of Natural Resources and Environment.

Graduates will have the capability to optimize packaging processes, design environmentally-appropriate packaging systems as part of the entire packaging life cycle chain, and they will help develop the next generation of advanced technologies to support the broader community and industries involved with packaging. The demand and necessity for packaging materials and services related to virtually all industrial sectors dictates that graduates in this field also must play key roles in interfacing with many industries.

We anticipate that offering this degree at Virginia Tech will permit residents of the Commonwealth to take advantage of education in this field without having to travel to out-of-state Universities, and in-turn, our program will attract out-of-state students. This will result in quality of life improvements for Virginians, and help to promote economic growth via the influx of out-of-state tuition and spending. We anticipate that the *Packaging Systems and Design* B.S program will serve as a catalyst for packaging-related training programs at regional and community colleges and as a focal point to draw packaging firms to the region.

Curriculum

The curriculum for the B.S. in *Packaging Systems and Design* has been developed based on a review of curricula at major packaging programs throughout the U.S. (Appendix K), on our review of the needs of various packaging industries (See Appendix D), and on direct discussion with and input from packaging companies.

The course content for the degree combines critical content from the fields of industrial engineering, industrial design, chemistry, material science, and marketing. Providing the opportunity to gain hands-on experience in various packaging areas is an essential part

of the proposed degree program. Students are encouraged to obtain experience either through activities sponsored by the Center for Packaging and Unit Load Designs) within the Department of Sustainable Biomaterials (a Center that has existed for 30 years at Virginia Tech and provides infrastructure support for the developing degree program) and/or related summer employment and student club activities.

The proposed *Packaging Systems and Design* program includes 120 credit hours distributed among the following categories: 1) curriculum liberal education (36 credits); 2) *Packaging Systems and Design* core (42 credits); 3) statistical analysis (3 credits); 4) writing skills (3 credits); 5) chemical and physical sciences (6 credits) and 6) free electives (30 credit hours). Table 1 lists new and revised courses to be included in the proposed degree program. A list of included courses is provided below.

Curriculum for Liberal Education (general education) (36 credits)

Area 1: Writing and Discourse (6 credit hours: Freshman English, ENGL 1105 & 1106)

Area 2: Ideas, Cultural Traditions, and Values (6 credit hours)

Area 3: Society and Human Behavior (6 credit hours: ECON 2006 and other)

Area 4: Scientific Reasoning and Discovery (8 credit hours: BIOL 1105 & 1115, CHEM 1035 & 1045)

Area 5: Quantitative and Symbolic Reasoning (6 credit hours: Calculus, MATH 1016 and other)

Area 6: Creativity and Aesthetic Experience (1 credit)

Area 7: Critical Issues in a Global Context (3 credit hours: ISE 4304)

Packaging Systems and Design Core: (42 credits)

SBIO 2104 Principles of Packaging (3)

*SBIO 2114 Packaging Law and Regulation (3)

SBIO 2124 Structure and Properties of Sustainable Biomaterials (3)

SBIO 2384 Behavior of Sustainable Biomaterials (3)

SBIO 2614 Introduction to Forest Products Marketing (3)

SBIO 3124 Paper and Paperboard Packaging (3)

*SBIO 3214 Food and Health Care Packaging (3)

SBIO 3224 Packaging Distribution Systems (3)

*SBIO 3284 Packaging Polymers and Production (3)

SBIO 4024 Packaging Design for Global Distribution (3)

*SBIO 4054 Packaging Systems Design Practicum (3)

SBIO 4224 Wood Pallet, Container & Unit Load Design (3)

MKTG 3104 Marketing Management (3)

MKTG 4204 Consumer Behavior (3)

*indicates a new course

Chemical and Physical Sciences: (6 credits)

PHYS 2205 General Physics (3)

CHEM 1036 General Chemistry (3)

Statistics: (3 credits)

STAT 2004 Introduction to Statistics (3)

Technical Writing Skills: (3 credits)

ENGL 3764 Technical Writing (3)

Free Electives: (30 credits)

Free elective courses chosen by student.

Table 1. New and revised courses in the *Packaging Systems and Design* degree program

| Course | Staffing |
|--|------------------|
| *SBIO 2114 Packaging Law and Regulation | Robert Bush |
| *SBIO 3284 Packaging Polymers and Production | Young-Teck Kim |
| *SBIO 3214 Food and Health Care Packaging | Young-Teck Kim |
| **SBIO 3224 Packaging Distribution Systems | Laszlo Horvath |
| **SBIO 4024 Packaging Design for Global Distribution | Laszlo Horvath |
| *SBIO 4054 Packaging Systems Design Practicum | Horvath/Kim/Bush |

*new courses developed for this degree

**revised courses for this degree

Admission Requirements

Students will be admitted to the program from the general applicant pool of Virginia Tech or will transfer into the program from within or outside of Virginia Tech. No special admission requirements for this program are anticipated or required. Admission to Virginia Tech requires that students entering as freshmen meet the following academic requirements:

- 18 units of high-school course work
- 4 units of English
- 3 units of math (includes algebra I, geometry, and algebra II)
- 2 units of laboratory science (chosen from biology, chemistry or physics)
- 2 units of social science (one must be history)
- 3 additional academic units (foreign language is highly recommended)
- 4 elective units
- Virginia Tech accepts either the SAT Reasoning Test (including critical reading and math) or ACT test scores
- GPA: Mid-50% = 3.81–4.24 (average = 4.0); This means that 25% of freshmen offered admission to Virginia Tech had GPAs lower than 3.81; each applicant is evaluated in the context of the high school(s) attended
- SATs: Mid-50% = 1160–1340 (average = 1250); This means that 25% of freshmen offered admission to Virginia Tech scored below 1160 on the SAT (combined critical reading and math)
 - Applicants whose native language is not English must demonstrate proficiency in English by taking Test of English as a Foreign Language

(TOEFL) or International English Language Testing System (IELTS) tests.
Minimum IELTS score for admission is 6.5

- Minimum TOEFL score for admission:
 - Internet-Based Test (IBT): 80 with no sub-section score less than 16
 - Computer-Based Test (CBT): 207
 - Paper-Based Test (PBT): 550

Faculty

The primary faculty members involved in the degree program are currently employed in the Department of Sustainable Biomaterials at Virginia Tech (Appendix C) and are well qualified to provide the leadership and course content necessary to make the program successful.

Learning Outcomes and Assessment

A successful graduate from the degree program will have skill sets that include: 1) design and evaluation of packaging for both existing and new products, 2) technical knowledge relative to improving packaging sustainability by reducing waste and transportation costs, 3) the ability to evaluate consumer needs and behavior regarding packaging systems and designs, and 4) an understanding of how graphic design can be used to develop appealing packaging that also complies with national and international regulations.

Students who graduate from the B.S. in Packaging Systems and Design program will be able to:

- 1) Apply the five primary packaging principles throughout the whole value-chain.
These are: Contain, Preserve, Protect, Transport, and Communicate
- 2) Design packaging systems that address the social, economic, and environmental aspects of sustainability
- 3) Demonstrate skills in written, oral, and graphic communication, to both technical and non-technical audiences
- 4) Relate global environment issues to packaging practices
- 5) Engage in strategic design solutions utilizing an array of packaging materials

While this information is collected on a course-by-course basis, the aggregate of all reports will be reviewed by our undergraduate curriculum committee in the packaging area for continuous improvement in the curriculum on a two-year cycle.

An overarching goal to be evaluated as part of student and program assessment is the ability of students to understand and apply the five major principles of packaging as outlined above (Contain, Preserve, Protect, Transport, and Communicate) throughout the whole packaging value-chain. The program will evaluate the student's abilities in these areas through standard means including coursework and examinations, and through student and employer surveys as detailed below.

Program Assessment

Program assessment will occur through regular reviews of student performance and experiences and through the use of industry and government agency feedback as detailed in Table 2.

Table 2. Program Assessment Channels and Mechanisms: *Packaging Systems and Design*

| Student Performance & Experiences | Mechanism |
|--|-----------------------------|
| <u>Learning outcomes</u> <ul style="list-style-type: none"> • Graduation rate • Grade point averages (after sophomore & final years) • Biomaterials and Bioenergy core course grades • Selected chem./phys./bio course grades • Student choice of professional electives (writing or technical skills) | Data base |
| <u>Exit poll of graduating students</u> <ul style="list-style-type: none"> • Rate/comment on experiential learning activity • Describe positive & negative impressions of degree • Describe employment status/outlook <u>Poll of students 2 years after graduation</u> <ul style="list-style-type: none"> • Describe employment status/outlook • Describe positive & negative impressions of degree | |
| Industry & Government Feedback <u>Companies & government organizations affiliated with discipline</u> <ul style="list-style-type: none"> • Review curriculum and program vision <u>Companies & government organizations employing graduates</u> <ul style="list-style-type: none"> • Review student preparation • Review curriculum and program vision | Web-based poll/ database |

Emphasis will be placed on an integrated and coordinated review of assessment data collected through web-based tools and stored in a database. Assessment for the program through the lens of the measurable learning outcomes indicators above will be the foundation from which to monitor our program and improve it as technology and science evolve. A shared trust between the learners and the faculty will be created by having the learning outcomes relate to meaningful and high expectations. Assessments in each course will use a variety of methods for student learning evaluation such as examinations, quizzes, laboratory reports, student projects, written papers, and oral presentations. Included in this approach will be evaluation of skills in experiential learning exercises by faculty or supervisors. This requirement will provide an opportunity to evaluate higher order learning skills such as critical thinking and creative

thinking. Student feedback regarding individual courses and instruction will be obtained through on-line evaluation of each course.

Emphasizing integration and coordination of assessment data, companies and government organizations will be engaged in critical review of the program and its effectiveness. This would include companies and government organizations that are affiliated with the discipline described here, but that have not hired our graduates. Likewise, the employers of our graduates will of course be invaluable for program assessment.

Academic Program Review

The Department and its degree programs go through the Academic Program Review conducted by the Office of the Provost at Virginia Tech. This review is required at least once every seven years. Our last departmental review was in 2010 and it is anticipated that we will be reviewed again in 2017 (the target enrollment year for this degree program).

Benchmarks of Success

Based on both Virginia Tech student interest, and on that of secondary education students who have contacted us in the past several years, we are confident that a program based at Virginia Tech will grow to 80 students within 4 years of initial offering. The program will be considered a success if:

- It attains 80 majors by the fourth year it is offered (2016-2017);
- Eighty percent or more of the majors complete the program requirements in 4 years or fewer;
- Eighty percent of the graduates find employment in packaging and allied fields or pursue graduate or professional education; and
- Seventy-five percent of employers and stakeholders interacting with our students have overall positive reports 3 years after graduation as determined by polls of advisory boards to our various Centers within the Department.

Student progress in the major will be monitored each spring to determine whether or not we are meeting the desired levels above. Students who are contemplating leaving the program will be interviewed to determine if changes in advising, or other elements of the program, can be implemented to better serve them.

- Exit interviews with graduating seniors are currently conducted in both the fall and spring of each year through the Virginia Tech Office of Academic Assessment. We will supplement that process with an annual on-line survey. This survey will specifically assess student's changing interests in the degree programs of the department, varying degrees of interest in several different aspects of the overall *Packaging Systems and Design* degree program, and provide space for comments on the strengths and weaknesses of program elements. These surveys will provide us longitudinal data from which we can track changes and deduce causes for those changes. For example:

- Which courses are influential in leading students into the *Packaging Systems and Design* field and relate more positively to various elements of the program?
- In what order are courses taken when flexibility is given within programming categories?

The results of the annual survey will be studied and evaluated each year by the undergraduate curriculum committee.

Relation to Existing Programs

This degree program is not related to any existing degree programs, but a Packaging Science option for the current Wood Science and Forest Products major does exist, as well as a Packaging Science minor, both in the Department of Sustainable Biomaterials. Once the B.S. degree in Packaging Systems and Design is approved, the Packaging Science option will be terminated. However, given that the Packaging Science minor has been very successful, it will continue to be available to serve student needs.

Collaborative or Stand-Alone Program

The B.S. degree program in Packaging Systems and Design is a standalone degree.

II. Justification for the Proposed Degree Program

Response to Current and Future Societal Needs

Packaging is a cutting-edge discipline requiring a highly educated workforce, with the capacity to provide a variety of employment opportunities in diverse industries. Multi-functional packaging systems serving various roles have been demanded by consumers, industries, and communities in the 21st century (Packaging Print Worldwide, 2010). According to the US and Global Market Size Study (Datamonitor 2010a, Datamonitor 2010b), packaging is the third largest industry in the US with \$120 billion in annual revenues. The industry's market size in 2014 is forecast to have a value of \$126 billion in the US alone, an increase of 4.8% from 2009 during a recessionary period. Also by 2014, the US container and packaging market is forecast to generate a packaging volume of 82 thousand tons. Typically, sustainable packaging systems are the largest segment of the market. United States markets account for around 30% of the global container and packaging market size and this segment of the market continues to expand. The global market size of the packaging and container industry was \$420 billion as of 2009 and it is forecast to have a value of \$493 billion in 2014; an increase of 17.4% over a 5-year period.

These statistics alone do not reflect the complexity of packaging-related markets. More detailed analyses suggest that the packaging industry market growth potential is far greater than these statistics suggest (World Packaging Organization, 2005). Several major packaging industries (e.g. Amcor Limited, Ball Corporation, Bernis Company, Inc., Dupont, International Paper Company, MeadWestvaco, PrintPack, Smufit Kappa Group Plc, and TetraPac) not only produce raw packaging materials but also packaging consumer end-products as described above. Related to these industries, several trade organizations (e.g., the National Wood Pallet and Container Association, International

Corrugated Packaging Foundation, and Glass Packaging Institute) and federal and government agency (e.g., Food & Drug Administration, United States Department of Agriculture) are located in Virginia. The interest generated by these organizations within the entire industry puts prominence on the Commonwealth of Virginia, and in particular the need for a Packaging degree program that can serve both industry and non-profit organizations. Implementation of this B.S. degree program would move the Commonwealth into the educational forefront of this vital and expanding field.

Second, the world of packaging is diverse and continues to change at an overwhelming pace. As in any other sector of education and business, however, a multitude of external challenges and influences exist that impact the overall environment of the field, and impact educational goals. Concerns about how human activity affects the environment means that our daily lives are now being examined at ever-closer levels to assess how individual human activity and community activity can be harmonized with nature. Packaging materials if not properly designed can persist in the environment as a source of waste or pollution. A large number of policies, regulations, and legislation directed toward packaging businesses, and focused on environmental issues, have impacted education in the field in recent years, in the U.S. and beyond (FDA <http://www.fda.gov/regulatoryinformation/legislation/ucm148722.htm>; Export.gov http://www.export.gov/faq/eg_main_017514.asp). Regulation to reduce the environmental impact of packaging has resulted in the need for continual innovation by educated professionals in the field to develop optimized *packaging systems and designs* through the whole packaging life cycle chain. As a result, there has been a strong demand in the field for college graduates with training in technical areas to help businesses keep up with continued demand in the field while adapting to changing business and technology environments (Sustainable Packaging Coalition report 2011, <http://sustainablepackaging.org/uploads/Documents/Definition%20of%20Sustainable%20Packaging.pdf>). Undergraduate educational programming in the field of packaging is in demand particularly with regard to degree programs that have a focus on issues such as environmental sustainability, economic efficiency, and social aspects to meet societal demands in the packaging field. (<http://www.cpis.msu.edu/cpis/mission>, <http://schoolofsustainability.asu.edu/?gclid=CIXj5KKag68CFc-R7Qod3So32A>)

Relevant higher education in this academic area must serve students based upon these expectations and trends. Virginia Tech is exceptionally well-positioned to offer a B.S. in Packaging Systems and Design, with the graduates of this unique degree program being able to combine traditional and advanced packaging technologies to develop renewable and sustainable packaging materials and designs permitting optimization of both packaging processes and material use. The degree will support graduates who understand technologies for producing environmentally appropriate packaging products, produced in an efficient and economical manner.

The proposed B. S. degree in Packaging Systems and Design will focus on the multidimensional aspects of packaging technology to meet unique needs for society and fit the diverse needs of an industry which has many unique and niche markets. The success of major and minor academic degree programs in the field has already been demonstrated by universities in several other states, (e.g., [California](#), [Michigan](#), [New York](#), [Wisconsin](#), [South Carolina](#)) but no other state other than perhaps California has as

great a need for highly educated packaging experts when compared to Virginia because of Virginia's strong industrial base, its geographic positioning as a transportation hub, and its status with major port cities on the eastern seaboard including the major shipping ports of Norfolk, Portsmouth and Newport News. [See the Virginia Port Authority <http://www.portofvirginia.com/>]. A workforce trained to understand highly advanced packaging technologies is necessary to support industries that have developed around this hub [See <http://vtrc.virginiadot.org/DynamicPage.aspx?PageId=4> for further information about Virginia's advanced transportation infrastructure.] Despite our centralized location and the demand from both the global community and industry, Virginia does not offer a higher education program or degree at any college or university in the Commonwealth to produce the well-trained packaging professionals necessary to support this need. Implementation of this B.S. degree program would move the Commonwealth into the educational forefront of this vital and expanding field.

The packaging industry in Virginia includes companies engaged in distribution and retail trade with cross-sectional industry links to national and international groups with similar objectives. The courses in our proposed B.S. degree in Packaging Systems and Design recognize the changing face of the industry as it adapts to new challenges. We provide students with the latest technological knowledge, but also the knowledge of societal and policy issues. With this balance, students learn strategies to adapt and grow technologies to meet a variety of changing demands. Our goal is to produce a highly marketable graduate, but also to grow our reputation at Virginia Tech as a Packaging program that produces highly valuable graduates with a combination of technical and socioeconomic knowledge in the field.

Historically, the Department of Wood Science and Forest Products (now called the Department of Sustainable Biomaterials) has had strong expertise on the research and outreach side of the packaging field since the establishment of a tertiary packaging laboratory in 1976 (PDS Newsletter, 2010). For three decades, this laboratory served a relatively small segment of the packaging industry in the area of packaging distribution and transportation. The Center for Packaging and Unit Load Design (CPULD) was developed in the 1990s at Tech to support the Pallet Lab with expanded professional services and consultation to various industries in the area of packaging, palletization, material handling, and unit load design. These areas have important historical value, but it must be recognized that our proposed academic degree program will expand far beyond pallet and unit load issues to encompass the broader aspects of Packaging Systems and Design.

Employment Demand

At Virginia Tech we anticipate strong demand for the proposed B.S. in Packaging Systems and Design by three audiences:

(1) Students interested in the program both for the many strong and highly paid career options, and for general interest in the area of packaging science See Appendix F for Virginia Tech student survey results.

(2) Industrial employers looking to the Commonwealth’s universities for professionally-trained packaging specialists in areas related to the design of sustainable packaging systems,

(3) Non-profit organizations or federal agencies looking for professional packaging specialists or consultants with a perspective of the field specific to health, economic and environmental packaging related issues.

Based upon the information provided in this Justification we expect that a Packaging Systems and Design degree at Virginia Tech will start off strong and will grow rapidly to increase the total undergraduate student body at Virginia Tech while also helping to enhance the overall marketability of Tech students.

Graduates in the B.S. *Packaging Systems and Design* program will be employed as Packaging Engineers, Packaging Managers, or Packaging Development Scientists. Unfortunately, these jobs are not classified either by the U.S. Department of Labor, the Bureau of Labor Statistics, or the Virginia Employment Commission. Due to the overlapping nature of this field collecting information on the demand for packaging professionals from statistical data is a difficult process. The profession perhaps closest to Packaging Scientist in some areas is Food Scientist and Technologist. In addition, packaging engineering is closely related to some industry-specific aspects of Industrial Engineering, Chemists and Material Scientists, Commercial and Industrial Design, and Materials Engineers. Therefore, employment statistics and future projections of the above mentioned professions for industries closely related to packaging have been used to provide information about the present and future employment of packaging engineers (Table 3). Table 4 provides estimates of packaging-related employment in the Commonwealth of Virginia.

Table 3. Packaging Occupational Employment in the U.S. 2010-2020

| Occupational Title | SOC Code | Employment 2010 | Projected Employment 2020 | Percent Change, 2010-2020 |
|---|----------|-----------------|---------------------------|---------------------------|
| Food Scientist and technologist | 19-1012 | 13,900 | 15,000 | 8% |
| Environmental Scientist and Specialist. Including Health Care | 19-2041 | 89,400 | 106,100 | 19% |
| Environmental Engineering Technicians | 17-3025 | 18,800 | 23,300 | 24% |
| Chemists and Material Scientists | 19-2030 | 90,900 | 94,900 | 4% |

| | | | | |
|------------------------------|---------|--------|--------|------|
| Commercial Industrial Design | 27-1021 | 40,800 | 45,100 | 10% |
| Materials Engineers | 17-2131 | | | 2.5% |
| Industrial Engineers | 17-2112 | | | |

Projection Source: Bureau of Labor Statistics. Occupational Outlook Handbook, 2010-2018. Available at: <http://www.bls.gov/oco>. Downloaded March 29, 2011.

Table 4. Packaging Occupational Employment in the Commonwealth of Virginia 2010-2020

| Occupational Title | SOC Code | Employment 2008 | Projected Employment 2018 | Percent Change, 2010-2020 |
|---|----------|-----------------|---------------------------|---------------------------|
| Environmental Scientist and Specialist. Including Health Care | 19-2041 | 3,192 | 4,296 | 3% |
| Environmental Engineering Technicians | 17-3025 | 567 | 733 | 2.6% |
| Chemists and Material Scientists | 19-2030 | | | |
| Commercial Industrial Design | 27-1021 | | | |
| Materials Engineers | 17-2131 | | | |
| Industrial Engineers | 17-2112 | | | |

Projection Source: Bureau of Labor Statistics. Occupational Outlook Handbook, 2010-2018. Available at: <http://www.bls.gov/oco>. Downloaded March 29, 2011.

Students in the Packaging Systems and Design field find employment in private sectors, with the top five primary employers of packaging engineers being: Cryovac, Dow Chemical, Tetra Laval, International Paper, Smurfit Kappa, and MeadWestvaco. Advanced study through enrollment in graduate school is another option for graduates of our proposed degree program.

The median annual wage for food scientists and technologists was \$59,520 in May 2008. The middle 50 percent earned between \$43,600 and \$81,340. The lowest 10 percent earned less than \$33,790, and the highest 10 percent earned more than \$104,520.

The starting salary in the public sector is \$53,000- \$76,000 (payscale.com) for Packaging Engineer, \$59,000-\$96,000 (payscale.com) for Packaging Operations Manager, and ~\$65,000 (simplyhired.com) for Packaging Research Scientist.

Using the closest match for our graduates, Food Scientist and Technologist positions are expected to grow nationally by 15% from 2008 to 2018 (Appendix K). Popular job search websites such as Monster (www.monster.com), indeed (www.indeed.com), Simply Hired (www.simplyhired.com) list the following total new jobs under the headings Packaging Engineering, Packaging Manager, Packaging Research Scientist on February 26, 2011 (Appendices D and summarized in Table 5).

Due to the broad nature of the packaging field job opportunities for packaging graduates are overlapped with the job opportunities for many fields. Example fields and their occupational demand are presented in Appendix L, which clearly indicates a significant increase in employment in fields closely related to packaging.

Table 5. Packaging-Related Employment Opportunities Listed on Major Internet Job Search Websites

| | Monster, 2012 Accessed: www.monster.com , March 25, 2012 | Indeed, 2012 Accessed: www.monster.com , March 25, 2012 | Simply Hired, 2011 Accessed: www.simplyhired.com , February 22, 2011 |
|------------------------------|--|---|--|
| Packaging Engineer | 108 | 163 | 218 |
| Packaging Manager | 52 | 76 | 15 |
| Packaging Research Scientist | 4 | 3 | 0 |

With regard to the demand in Virginia by employers: With the implementation of this degree students will be able to obtain a Packaging Degree in the Commonwealth and be employed after graduation by Virginia employers.

Student Demand

The undergraduate student body at other major packaging programs throughout the U.S. exceeds 1000 students in enrollment, indicating the tremendous potential for student recruitment and future student enrollment.

Despite the historical strength of Packaging research at Virginia Tech, packaging science education has been offered only as an option or minor; and those offerings have been poorly promoted in the past even though employer demand for graduates has been very strong. Programs across the country that are offering Packaging degree programs have significant enrollments (Table 3). The information presented above, as well as anecdotal information from current students in the minor with comments such as: "...if students only knew about this program!!" suggest that our proposed B.S. in Packaging Systems and Design would be very attractive with strong enrollments (See Appendix G for letters from current students).

Table 6. Enrollment statistics of major packaging schools throughout the United States

| University | Degree | Number of Students |
|------------------------------------|---------------------|---------------------------|
| Michigan State University | B.S. in Packaging | 500 |
| Clemson University | B.S. in Packaging | 200 |
| California Polytechnic State Univ. | Option in Packaging | 200 |
| University of Wisconsin - Stout | B.S. in Packaging | 210 |
| Rochester Institute of Technology | B.S. in Packaging | 240 |

Compiled in 2011 with most recent statistics available at each institution

A B.S. in Packaging Systems and Design at Virginia Tech would enhance students chances to compete against the graduates of other programs such as Michigan State and Clemson and would supply more extensive and relevant knowledge in the major field of packaging science including food packaging, pharmaceutical packaging, and graphic design. Statements of interest and the results of a survey of Virginia Tech students are included as Appendix F and G.

Duplication

Packaging Science is listed under CIP code 15.1503 code in the 2010 version of the Classification of Instructional Programs There are no higher education programs listed in this category at Virginia Tech or at any other College or University programs across the Commonwealth.

There are three other areas that may be considered in some contexts to have partial overlap with Packaging Science. These areas and CIP codes are:

01.102 - Food Technology and Processing. *A program that focuses on the application of chemical, physical, and engineering principles to the development and implementation of manufacturing, **packaging**, storage, and distribution technologies and*

processes for food products. Includes instruction in food engineering, food preservation and handling, food preparation, food packaging and display, food storage and shipment, and related equipment and facilities design, operation, and maintenance.

50.0404 - Industrial Design. A program in the applied visual arts that prepares individuals to use artistic techniques to effectively communicate ideas and information to business and consumer audiences via the creation of effective forms, shapes, and **packaging** for manufactured products. Includes instruction in designing in a wide variety of plastic and digital media, prototype construction, design development and refinement, principles of cost saving, and product structure and performance criteria relevant to aesthetic design parameters.

50.0401 - Design and Visual Communications, General. A program in the applied visual arts that focuses on the general principles and techniques for effectively communicating ideas and information, and **packaging** products, in digital and other formats to business and consumer audiences, and that may prepare individuals in any of the applied art media.

In Virginia, no programs are reported under the *Food Technology and Processing* code. Many institutions have programs that report involvement in the areas of *Design and Visual Communication, General*, but only one, Virginia Tech, reports under the heading of *Industrial Design*. In Design and Visual Communication only Westwood and Radford University offer a B.S. degree. These programs focus primarily on graphical packaging design, while the proposed B. S. Packaging program at Virginia Tech would offer a comprehensive *packaging system and design* approach that incorporates the science, technology, and business aspects of packaging. The aforementioned packaging design programs would complement the proposed Packaging Systems and Design program at Virginia Tech, but would not overlap or duplicate the content proposed, or satisfy the need for graduates with expertise in this area.

Projected Enrollment

Table 7 provides five-year projections for enrollment in the proposed program by headcount and full-time equivalent students.

Table 7. Projected Enrollment in a B.S. Program in *Packaging Systems and Design* at Virginia Tech

| Year 1 | Year 2 | Year 3 | Year 4 Target Year (2- year institutions) | Year 5 Target Year (4-year institutions) |
|-------------|-------------|-------------|--|---|
| 2013 - 2014 | 2014 - 2015 | 2015 - 2016 | 2016 - 2017 | 2017 - 2018 |

| | | | | | | | | | | | |
|------------|------------|------------|------------|------------|------------|------------|------------|------|------------|------------|------------|
| HDCT 20 | FTES 20 | HDCT 40 | FTES 40 | HDCT 60 | FTES 60 | HDCT 80 | FTES 80 | GRAD | HDCT 80 | FTES 80 | GRAD 18 |
|------------|------------|------------|------------|------------|------------|------------|------------|------|------------|------------|------------|

1. Retention: 90%
2. Full-time students: 100%
3. Part-time students: 0%
4. Expected time to graduation (FT students): 4 years
5. Number of credit hours per semester (FT students): 15 hours/semester

III. PROJECTED RESOURCE NEEDS FOR THE DEGREE

Full Time Faculty

Two Assistant Professors of Practice were recently hired to teach some of the required courses in the proposed *Packaging Systems and Design* degree program (Horvath: 1 FTE; Kim: 1 FTE). The two newly hired packaging faculty members are supported by the “Scott Francis endowment” funding that is focused on educational and research support specifically for the field of packaging. Also, Dr. Robert Bush (1.25 FTE) will teach four core courses in the degree program, covering the business law and marketing aspects of packaging science. In addition to the current packaging faculty members, additional members of our faculty have research interests related to sustainable packaging material development. Collaboration and interaction with these other faculty will provide benefit to students in the program, while supporting the packaging activities of the core faculty members in the proposed degree program.

Part-Time Faculty

Two other faculty members from our department (Zink-Sharp: .25 FTE; Rennecker: .25 FTE) and six faculty members from other departments (1.50 FTE) will also contribute to the core curriculum.

Adjunct Faculty

No adjunct faculty will be involved with this degree program.

Graduate Assistants

As initial class sizes will be relatively small, we will not request additional graduate assistants at this time.

Targeted Financial Aid

We have no targeted Financial Aid.

Library

Most of the data and information required by this undergraduate program are real-time and are readily available over the Internet. We see no shortcomings of the library at Virginia Tech in this area. A library catalog search located all major packaging journals, magazines, and books.

Space

Dedicated space for the undergraduate education will be located in the Brooks Center within the Virginia Tech Corporate Research Park, and will include a packaging materials laboratory, pallet testing laboratory, computer lab and class rooms.

Additionally, the required office and office equipment space for all faculty exists and has already been provided.

Classified Positions

No new classified positions will be needed for the program. Classified personnel in the Department currently working on academic matters under the current degree (Forestry and Wildlife) will be used to work in the new degree program. Administrative requirements will be handled by existing resources within the Department of Sustainable Biomaterials.

Equipment (including computers)

No new equipment needs are anticipated; however, given industry response to date as we notify cooperators of our plans to potentially offer a program in *Packaging Systems and Design*, we anticipate strong support in providing equipment and funding to set up state of the art lines that will allow our students to stay abreast of the latest technological developments in the field.

Telecommunications

No new resources will be needed for telecommunications. Telecommunication needs for student access can be handled with our current infrastructure and department budget allocations.

Other Resources (specify)

No other resources are required.

General Budget and Estimated Resources

IV. CERTIFICATIONS

Part A: Answer the following questions about general budget information.

Has or will the institution submit an addendum budget request to cover one-time costs? Yes _____ No X _____

Has or will the institution submit an addendum budget request to cover operating costs? Yes _____ No X _____

Will there be any operating budget requests for this program that would exceed normal operating budget guidelines (for example, unusual faculty mix, faculty salaries, or resources)? Yes _____ No X _____

Will each type of space for the proposed program be within projected guidelines? Yes X _____ No _____

Will a capital outlay request in support of this program be forthcoming? Yes _____ No X _____

Part B: Fill in the number of FTE positions needed for the program

| | Program Initiation Year 2013 ___ - 2014 ___ | | Expected by Target Enrollment Year 2017 ___ - 2018 ___ | |
|---|--|----------------|--|-------------------------------|
| | On-going and reallocated | Added (New) | Added (New)** | Total FTE position s |
| Full-time faculty* | 1.00 | | 2.25 | 3.25 |
| Part-time faculty (faculty FTE split with other unit(s)) | 1.50 | | 0.75 | 2.25 |
| Adjunct faculty | | | | 0.00 |
| Graduate assistants | | | | 0.00 |
| Classified positions | | | | 0.00 |
| TOTAL | 2.50 | 0.00 | 3.00 | 5.50 |

* Faculty dedicated to the program

** Added **after** initiation year

Part C: Estimated resources to initiate and operate the program

| | Program Initiation Year 2013 ___ - 2014 ___ | | Expected by Target Enrollment Year 2017 ___ - 2018 ___ | |
|---|--|------|---|-----------|
| | | | | |
| Full-time faculty | 1.00 | 0.00 | 2.25 | 3.25 |
| salaries | \$109,000 | | \$157,250 | \$266,250 |
| fringe benefits | \$33,736 | | \$48,669 | \$82,404 |
| Part-time faculty (faculty FTE split with unit(s)) | 1.50 | 0.00 | 0.75 | 2.25 |
| salaries | \$93,387 | | \$48,750 | \$142,137 |
| fringe benefits | \$28,903 | | \$15,088 | \$43,991 |
| Adjunct faculty | 0.00 | 0.00 | 0.00 | 0.00 |
| salaries | | | | \$0 |
| fringe benefits | | | | \$0 |
| Graduate assistants | 0.00 | 0.00 | 0.00 | 0.00 |
| salaries | | | | \$0 |
| fringe benefits | | | | \$0 |
| Classified Positions | 0.00 | 0.00 | 0.00 | 0.00 |
| salaries | | | | \$0 |
| fringe benefits | | | | \$0 |

| | | | | |
|-------------------------|------------------|------------|------------------|------------------|
| Personnel cost | | | | |
| salaries | \$202,387 | \$0 | \$206,000 | \$408,387 |
| fringe benefits | \$62,639 | \$0 | \$63,757 | \$126,395 |
| Total personnel cost | \$265,026 | \$0 | \$269,757 | \$534,783 |
| Equipment | | | | \$0 |
| Library | | | | \$0 |
| Telecommunication costs | | | | \$0 |
| Other costs (specify) | | | | \$0 |
| TOTAL | \$265,026 | \$0 | \$269,757 | \$534,783 |

Part D: Certification

The institution will require additional state funding to initiate and sustain this program.

_____ Yes _____
Signature of Chief Academic Officer

_____ No _____
Signature of Chief Academic Officer

If “no,” please complete Items 1, 2, and 3 below.

1. Estimated \$\$ and funding source to initiate and operate the program.

| Funding Source | Program initiation year 2013_ - 2014_____ | Target enrollment year 2017_ - 2018_____ |
|--|--|---|
| Reallocation within the department (Note below the impact this will have within the department.) | \$265,026 | \$534,783 |
| Reallocation within the school or college (Note below the impact this will have within the school or college.) | | |
| Reallocation within the institution (Note below the impact this will have within the institution.) | | |
| Other funding sources (Specify and note if these are currently available or anticipated.) | | |

2. Statement of Impact/Other Funding Sources.

Reallocation within the department: Support for this program will come from existing resources with no adverse impacts anticipated on the Department of Sustainable Biomaterials, or Virginia Tech. Faculty currently teaching in the Forestry and Wildlife degree will teach in this new degree once implemented. No new students will be enrolled in the B. S. Forestry and Wildlife after Fall 2013.

Reallocation within the college: No reallocation of resources within the college will be necessary.

Reallocation within the university: No reallocation of resources within the university will be necessary.

3. Secondary Certification.

If resources are reallocated from another unit to support this proposal, the institution will **not** subsequently request additional state funding to restore those resources for their original purpose.

_____ Agree _____
Signature of Chief Academic Officer

_____ Disagree _____
Signature of Chief Academic Officer

V. REFERENCES

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VI. APPENDICES

Appendix A – Core Course Descriptions for Proposed Degree (*indicates new course; **indicates revised course)

SBIO 2104 Principles of Packaging (3)

Packaging systems, materials, and forms and their relationship with the requirements of global societies for the distribution and storage of industrial and consumer products; packaging laws and regulations.

***SBIO 2114 Packaging Law and Regulation (3)**

Study of the legal and regulatory issues affecting primary, secondary, and tertiary packaging and packaging systems. Labeling, food and drug, intellectual property, shipping, structural, and environmental laws and regulations affecting packaging design and use.

SBIO 2124 Structure and Properties of Sustainable Biomaterials (3)

Macroscopic and microscopic structure and basic chemical composition of biomaterials including wood, grasses, bamboo, and bagasse. Impact of structure on physical and mechanical properties. Identification of commercially important woods and other biomaterials. Preparation and analysis of microscope slides and scanning electron micrographs.

SBIO 2384 Behavior of Sustainable Biomaterials (3)

Physical properties of plant-derived materials and biobased polymer composites. Measurement techniques. Structure and influence on transport properties, response to heat, moisture, electricity, and light.

SBIO 2614 Introduction to Forest Products Marketing (3)

Study of marketing systems and methods used by North American primary and secondary forest product industries. Emphasis on wood product industries. Marketing of hardwood lumber, softwood lumber, panels, composites, furniture, and paper products. Role of North American industries and markets in world trade of forest products.

SBIO 3124 Paper and Paperboard Packaging (3)

Detailed study of sustainable packaging materials focusing on sheets, wood, paper, paperboard, biodegradable synthetic and natural polymer as well as glass, metal and metal foils. Provides a comprehensive, hands-on exploration of paper and paperboard

packaging Technologies. Includes understanding of packaging materials, manufacturing effects, characteristic test comparisons, die cutting and scoring.

*SBIO 3214 Food and Health Care Packaging (3)

Many types of food and health care packaging. Types, materials and properties, fabrication and functions for food and health care packaging systems. Sustainable food packaging, medical device packaging, aseptic packaging, package/product interactions, smart active packaging, handling of packages, and modified atmospheric packaging.

**SBIO 3224 Packaging Distribution Systems (3)

Unit load and parcel supply chains. Principles of operation and design of warehouse distribution and fulfillment centers. Principles of operation and design of shipping and distribution systems. The relation between packaging design, pallet design, and unit load design and the operation of industrial consumer goods supply chain.

*SBIO 3284 Packaging Polymers and Production (3)

Introduction to synthetic and natural polymer science and engineering as applied to packaging science. Packaging polymer morphology, rheology, physical properties. Processing methods, and polymerization. Detailed study of relationships among processing, structure, and properties. Industrial scale production of packaging articles in the area of flexible and rigid packaging.

**SBIO 4024 Packaging Design for Global Distribution (3)

Understanding, identification, and measurement of hazards in physical distribution. Design and analysis of packaging protection against such hazards as shock, vibration, compression, and climate. Includes laboratory tests of shock, vibration and compression, and performance testing of packaging and components.

* SBIO 4054 Packaging Systems Design Practicum (3)

Integrated application of principles of packaging design and manufacturing. Design briefs, package development process, structural requirements, manufacturing and distribution plans, target markets and positioning.

SBIO 4224 Wood Pallet, Container & Unit Load Design (3)

Wood pallet design and performance. The design of wood containers and crates. Design and performance of unit loads. Design and performance of unit load equipment, i.e. conveyors, racking systems, automatic guided vehicles, fork trucks. Principles of unit load design. Mechanical interactions between pallets, packaging, and unit load handling equipment. Unit load stabilization techniques, i.e. strapping, stretch wrapping.

International phytosanitation regulations of solid wood packaging; Principles of dunnage, blocking and bracing.

Appendix B – Sample Program of Study for Full-Time Student in B.S. in Packaging Systems and Design

| | Fall Semester | Spring Semester | Credit Hours |
|--------|--|---|--------------|
| Year 1 | CHEM 1035 General Chemistry (3)* | CHEM 1036 General Chemistry (3) ³ | 30 |
| | CHEM 1045 General Chemistry Lab (1)* | ENGL 1106 Freshman English (3)* | |
| | BIOL 1105 Principles of Biology (3)* | MATH 1016 Elem. Calculus w/Trig (3)* | |
| | BIOL 1115 Principles of Biology Lab (1)* | CLE Area 2 Elective (3)* | |
| | ENGL 1105 Freshman English (3)* | CLE Area 5 Elective (3)* | |
| | CLE Area 2 Elective (3)* | CLE Area 6 Elective (1)* | |
| | Total 15 | 15 | |
| Year 2 | SBIO 2104 Principles of Packaging (3) ¹ | SBIO 2614 Intro. to For. Prod. Mktg. (3) ¹ | 30 |
| | SBIO 2124 Struc. Prop. Sust Bmatls. (3) ¹ | SBIO 2384 Behavior Sustain Biomatl. (3) ¹ | |
| | STAT 2004 Intro. to Statistics (3) ² | SBIO 2114 Pkg. Law and Regulation (3) ¹ | |
| | ECON 2005 Principles of Economics (3)* or AAEC 1005 Econ. Food Fiber Systems (3)* | PHYS 2205 General Physics (3) ³ | |
| | Free Elective (3) ⁵ | CLE Area 3 Elective (3)* | |
| | | Total 15 | |
| Year 3 | ENGL 3764 Technical Writing (3) ⁴ | SBIO 3124 Paper and Paperboard Packaging (3) ¹ | 30 |
| | SBIO 3284 Pkg. Polymers & Prod. (3) ¹ | SBIO 3214 Food and Health Care Pkg. (3) ¹ | |
| | MKTG 3104 Marketing Management (3) ¹ | Free Elective (3) ⁵ | |
| | SBIO 3224 Pkg. Distribution Systems (3) ¹ | Free Elective (3) ⁵ | |
| | Free Elective (3) ⁵ | Free Elective (3) ⁵ | |
| | | Total 15 | |
| Year 4 | SBIO 4024 Packaging Design for Global Dist. (3) ¹ | SBIO 4224 Wood Pallet, Container, and Unit Load Design (3) ¹ | 30 |
| | MKTG 4204 Consumer Behavior (3) ¹ | SBIO 4054 Packaging Systems Design Practicum (3) ¹ | |
| | Free Elective (3) ⁵ | ISE 4304 Global Issues in Ind. Mgmt. (3)* | |
| | Free Elective (3) ⁵ | Free Elective (3) ⁵ | |
| | Free Elective (3) ⁵ | Free Elective (3) ⁵ | |
| | | Total 15 | |

*also counts in general education (Curriculum for Liberal Education)

| | |
|---|--|
| * | General Education (36 credit hours) |
| 1 | Packaging Systems and Design core (42) |
| 2 | Statistical Analysis (3) |
| 3 | Chemical and Physical Sciences (6) |
| 4 | Writing Skills (3) |
| 5 | Free Electives (30) |

*New courses that were developed and that have already been approved for this degree

**Revised courses for this degree

Appendix C – List of Faculty in Packaging Systems and Design (Department of Sustainable Biomaterials)

Robert Bush, Ph.D. (Virginia Tech, 1989) Professor: Marketing of forest products; management of wood and packaging industries; packaging marketing and law.

Laszlo Horvath, Ph.D. (North Carolina State University, 2010); Assistant Professor of Practice: Structural packaging systems, phytosanitation, pallet and unit load design, wood manufacturing and wood structural design.

Young Teck Kim, Ph.D. (Clemson University 2005) Assistant Professor of Practice: Sustainable packaging, biodegradable & plastic polymers, smart packaging in flexible & rigid systems, and food & pharmaceutical packaging.

Other faculty members in the Department teaching in the Core:

Audrey Zink-Sharp, Ph.D. (State University of New York, 1992) Professor and Associate Department Head: Quantitative anatomy of sustainable biomaterials, micro-mechanics, video microscopy for strain measurement.

Scott Renneckar, Ph.D. (Virginia Tech, 2004) Associate Professor of Sustainable Biomaterials: Novel processing methods for biomass, Applications of nanotechnology to biocomposite materials, nanocellulose.

Appendix D1– Letters of Support from Industry/Government



Professor Barry Goodell, PhD
Head, Department of Wood Science and Forest Products
230 Cheatham Hall, Virginia Tech
Blacksburg, Virginia. USA 24061

4 March, 2011

Dear Barry:

Please know that we at Tetra Pak are very supportive of you and your faculty member's efforts to build a new Major/Degree program in Packaging Systems and Design. Tetra Pak, the world's leading food packaging company (10€ Billion turnover), is very interested in hearing of this development.

As you know, I have had a chance to review your draft Curricula courses for this newly proposed program. I understand that ideally you would like to expand your offerings, but what you are proposing even now for your curriculum will be extremely beneficial for graduates seeking employment in the field, and they will produce a very well trained graduate. Particularly the upper level courses that you have outlined in "Food and Health Packaging, Packaging Polymers and Production, Packaging Systems Design will provide highly valuable training for persons interested in packaging areas that are closely allied with Tetra Pak's interests. Students will need to take the underlying coursework you list to have the background needed in particular strong fundamentals in physics and statistical design.

Tetra Pak employs approximately 20,000 people worldwide at all levels. I anticipate that graduates of Virginia Tech's proposed packaging degree program would fit well (and be eagerly sought out by our US and global groups) for positions ranging from quality control supervisors, development engineers and packaging technology specialists' through to management level trainees. I would also expect that with the strong reputation of Virginia Tech, that these graduates would do very well in our working environment.

I know from your previous history that this program will be one of strong performance and such a program will benefit everyone involved, from the students to employer. The job market for Packaging, and in particular the "packaging systems and design" area that you are targeting, is strong and it is growing. I look forward to discussing your program further, watching it grow, helping you to support it as you permit, and getting the chance to have some of Tetra Pak's divisions interview and ultimately employ your graduates!

All the best,

A handwritten signature in black ink, appearing to read 'L. Mott'.

Laurence Mott, PhD
Vice President, Packaging Technology
Tetra Pak International, Lund, Sweden



INTERNATIONAL CORRUGATED
PACKAGING FOUNDATION

March 4, 2011

Professor Barry Goodell, PhD
Head, Department of Wood Science and Forest Products
230 Cheatham Hall
Virginia Tech
Blacksburg, Virginia 24061

Dear Barry,

I was pleased to learn through a recent meeting with Bob Mollenhauer and correspondence with Professors Mark White and Young Teck Kim that the Virginia Tech packaging program is being expanded along the lines we envisioned when ICPF initially donated a CAD table and major testing equipment (squeezer & shock tester) to jumpstart the program and packaging lab there. ICPF strongly endorses the establishment of "Packaging Systems and Design" as a new packaging major and degree option within the Dept of Wood Science and Forest Products at Virginia Tech. This new program and designation will assist in recruiting students to the program, and in better engaging corrugated packaging firms in supporting student internships and in hiring new graduates from the packaging program.

ICPF was glad to have Virginia Tech participate again in ICPF's annual Careers in Corrugated International Teleconference with the other major packaging schools, and to continue to have Dwight Schmidt serve as the ICPF representative on the VT packaging program's advisory board. I know you also will be pleased with ICPF industry speaker Mike McFerrin's (COO, Triad Packaging) class room presentation next Thursday. We hope that through this introduction, Mike and Triad Packaging also may evolve into additional periodic mentors to the new VT packaging program, faculty and students there.

ICPF looks forward to its continued partnership with the Virginia Tech packaging program. Thank you.

Sincerely,

Richard M. Flaherty
President

Our Mission is Your Future
113 South West Street • Alexandria • VA 22314
Telephone: (703) 549-8580 • Fax: (703) 549-8670 • Email: info@icpfbox.org



PalletOne
1470 Highway 17 South (33830)
P.O. Box 819 (33831)
Bartow, FL
Phone: 863.533.1147
Fax: 863. 533.3065
www.PalletOne.com

March 3, 2011

Dr Marshall S White
Professor Emeritus
Dept of Wood Science and Forest Products
Virginia Tech
Blacksburg, VA 24060

Dear Dr White,

This letter is in support of the planned major and separate degree in Packaging Systems and Design in the Department of Wood Science and Forest Products. PalletOne is the largest pallet producer in the United States with facilities in Virginia. We have long supported the activities of the Center for Unit Load Design. The proposed major in Packaging Systems and Design will provide young professionals qualified to help companies such as ours, become more successful in the very competitive pallet supply market.

Human resources are the key to our success. This unique program, emphasizing a more systematic approach to designing the components of consumer and industrial products supply chains, will revolutionize supply chain design and significantly improve efficiency while reducing environmental impacts. Young professionals educated in these disciplines will be in demand. There is no other program in the region providing such educational opportunities for young professionals. The planned stand alone major and degree program will attract more qualified students.

PalletOne endorses this initiative and we look forward to tapping into this resource in the future.

Sincerely,

A handwritten signature in black ink, appearing to read "Howe Q. Wallace".

Howe Q. Wallace
Chief Executive Officer
PalletOne, Inc.



1400 Abbot Road, Suite 160
East Lansing, Michigan 48823 USA
p 517.333.3437 f 517.333.3813

www.ista.org

March 7, 2011

Marshall S White, PhD
Professor Emeritus
Packaging Science
Virginia Tech
Blacksburg, VA 24061

Dear Mark,

I write this letter on behalf of the 700-plus member companies of the International Safe Transit Association (ISTA) and in strong support for the expansion of the current undergraduate study option in Packaging Science at Virginia Tech into a separate major and degree granting program in "Packaging Systems and Design".

ISTA has a very close relationship with the Center for Unit Load Design and the Department of Wood Science and Forest Products at Virginia Tech as well as the other packaging programs in the United States. In this day and age of sustainability, ISTA feels very strongly regarding, what we call "Responsible Packaging By Design" and the need for more degree granting packaging education at the University level.

It is our opinion, which we know is shared by many others in the packaging profession, that there is a great demand for packaging professionals and the addition of another source for highly educated and trained engineers is most definitely needed. ISTA members would surely benefit directly from this expansion, especially with the continued emphasis on unit load design and distribution packaging that have been such a strong point in the program for many years. Currently ISTA has ten member companies in Virginia and there are about 20 or so companies in adjoining states who could also benefit from a pool of packaging graduates.

In conclusion, ISTA is positive that the expansion of the program and the offering of an undergraduate degree in packaging will generate more and better qualified students into the program that exists today and will provide a very unique opportunity for students from Virginia, one that is only offered today at a handful of other universities in the United States. This program expansion at Virginia Tech would help provide a resource in knowledge experts in packaging and help meet the future demand from corporations for packaging engineers.

ISTA wishes the faculty and administration a successful campaign toward the creation of a packaging undergraduate program as it seeks University and State approval.

Sincerely,

Edward A. Church, CPP
President

Appendix D2 – Letters of Support from Department Heads for Use of Courses Outside of the Home Department.

Subject: Letters of Support? - for outside courses MKTG 3104 and 4204

From: "Nakamoto, Kent" <nakamoto@vt.edu>

Date: Wed, 30 Mar 2011 21:35:40 -0400

To: -- <goodell@vt.edu>

Subject: RE: Letters of Support? - for outside courses MKTG 3104 and 4204

The Department of Marketing supports the inclusion of MKTG 3104 and MKTG 4204 in the new Packaging Systems and Design curriculum, the latter course on a space available basis.

Kent Nakamoto

R.B. Pamplin Professor of Marketing and Dept. Head

Associate Dean for Research, Pamplin College of Business

From: Goodell, Barry

Sent: Wednesday, March 30, 2011 3:28 PM

To: Nakamoto, Kent

Subject: Letters of Support? - for outside courses MKTG 3104 and 4204

Dear Dr. Nakamoto,

I am a new to the VT campus and I Head the Wood Science and Forest Products department. Our Department has been requested to submit new curricula through the SCHEV review process to allow our educational programming to come into compliance with SCHEV guidelines. For this purpose we are proposing a degree program in Packaging Systems and Design (in draft proposal form based upon our existing curricula with modifications) that we hope will be more attractive and valuable to students. If approved, it will take approximately 1-1/2 years before this degree can be offered. As part of this process, we are required to submit letters of support from other Departments offering courses that we have proposed including as part of our CORE (and which we currently have approval and support for under our current WOOD major).

Would you be able to provide an email letter of support similar to the model shown below for both your Department's MKTG 3104 and your MKTG 4204 courses? Under the current plan we would anticipate students in this degree program to be ready to take MKTG 3104 in the Fall of 2014 and MKTG 4204 in the Fall of 2015. Student numbers will ramp up slowly as the program grows, and we anticipate that approximately 15 students per year from this major (if approved) will require each course by 2016-2017.

The draft proposal for the Packaging Systems and Design degree is attached, and on page 27 you will find a curriculum sheet with the listing of the two courses by semester.

If you might be able to provide two email letters, one for each of the courses, with content similar to that outlined below, it would be appreciated.
I left a phone message with your secretary, and would be happy to talk with you about this any time. Thank you.

Barry Goodell

=====
Professor Barry Goodell, PhD
Head, Department of Wood Science and Forest Products,
230 Cheatham Hall, Virginia Tech. Blacksburg, Virginia. USA 24061
Phone: (540) 231-8853

Support for Chemistry Department courses in the degree

Dear Barry,

By means of this note, permissions are granted.

best wishes,

jim

J. M. Tanko, Professor & Chair
Department of Chemistry
Virginia Polytechnic Institute and State University
Blacksburg, VA 24061
phone: (540) 231-6687
e-mail: jtanko@vt.edu

On Dec 2, 2011, at 2:19 PM, Goodell, Barry wrote:

Dear Brenda, Jim, Peter, Eric and Beate,

As some of you are aware, the department of Wood Science and Forest Products has three degree proposals moving through University Governance review. Two of the proposals are being considered within the Committee on Undergraduate Curricula (CUC) but currently they have been tabled because of the need for permissions from

the home departments for our use of these courses. These proposed degrees are: 1) Sustainable Materials and Innovation and 2) Packaging Systems and Design.

I have listed the COS courses below by department for the two proposed degrees, and I am seeking permissions from each of you for use of the courses in our proposed curricula. The maximal number of students in each course from this degree would be 20 students/year.

Our Associate Dean, Dean Stauffer, has communicated with Jill Sible in COS, and Jill has suggested the language below that may be acceptable to you as a means of providing conditional permission, dependent on the availability of resources. If you are willing to provide the needed permissions, the use of language similar to this would be appropriate:

Permissions for use of the "course/lab will be available to students in the proposed degree provided there is sufficient enrollment support to meet course demand."

Please let me know if you would be willing to provide permission to allow our future students in these degrees access to your courses. Thank you.

Sincerely yours,

Barry Goodell

Head, Department of Wood Science and Forest Products

=====

PROPOSED DEGREE – Sustainable Materials and Innovation (SMI)

Core – 20 students/year after 4 years:

BIOL 1105 Principles of Biology (3)

BIOL 1115 Principles of Biology Lab (1)

CHEM 1035 General Chemistry (3)
CHEM 1045 General Chemistry Lab (1)

MATH 1016 Elem. Calculus w/Trig I (3)
MATH 2015 Elem. Calculus w.Trig II (3)

STAT 3615 Biological Statistics (3)
STAT 3616 Biological Statistics (3)

One SMI Track will also have 5 students/year (maximum after 4 years) with these additional proposed courses:

CHEM 1036 General Chemistry (3)
PHYS 2205 General Physics (3)

PROPOSED DEGREE – Packaging Systems and Design

Core only with no tracks – 20 students/year (maximum after 4 years):

BIOL 1105 Principles of Biology (3)
BIOL 1115 Principles of Biology Lab (1)

CHEM 1035 General Chemistry (3)
CHEM 1036 General Chemistry (3)
CHEM 1045 General Chemistry Lab (1)

MATH 1016 Elem. Calculus w/Trig I (3)

PHYS 2205 General Physics (3)

STAT 2004 Introduction to Statistics (3)

=====

Professor Barry Goodell, PhD

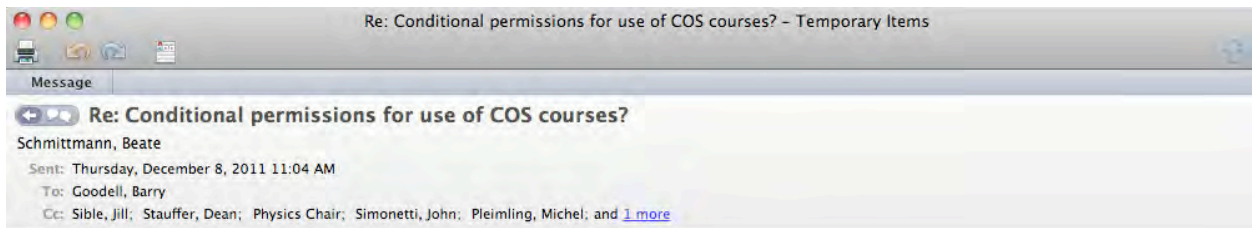
Head, Department of Wood Science and Forest Products

<http://woodscience.vt.edu/>

230 Cheatham Hall, Virginia Polytechnic Institute and State University (Virginia Tech). Blacksburg, Virginia. USA 24061

Phone: (540) 231-8853

Support for Physics Department courses in the degree



Barry,

The Department of Physics approves the inclusion of PHYS 2205 into your proposed degree programs in "Sustainable Materials and Innovation" (SMI) and "Packaging Systems and Design".

This approval is contingent upon the availability of the necessary resources. Specifically, our course will be available to your students in the proposed degrees provided there is sufficient enrollment support to meet course demand.

We wish you much success with this program.

With best regards,
Beate.

Support for Biology Department courses in the degree



College of Science

Department of Biological Sciences
2089 Derring Hall (0406)
Blacksburg, Virginia 24061
540/231-3803 Fax: 540/231-9307
E-mail: rawalker@vt.edu
www.biology.vt.edu

December 8, 2011

Barry Goodell, Ph.D.
Head, Dept. of Wood Science and Forest Products
230 Cheatham Hall
Virginia Tech, Blacksburg, VA 24061

Dear Dr. Goodell,

The Department of Biological Sciences approves the inclusion of BIOL 1105 Principles of Biology and BIOL 1115 Principles of Biology Lab on the checksheets for your proposed new degrees in Sustainable Materials and Innovation and Packaging Systems and Design.

Please note our ability to provide seats to students in these degrees is dependent on sufficient enrollment support to meet course demand.

Sincerely,

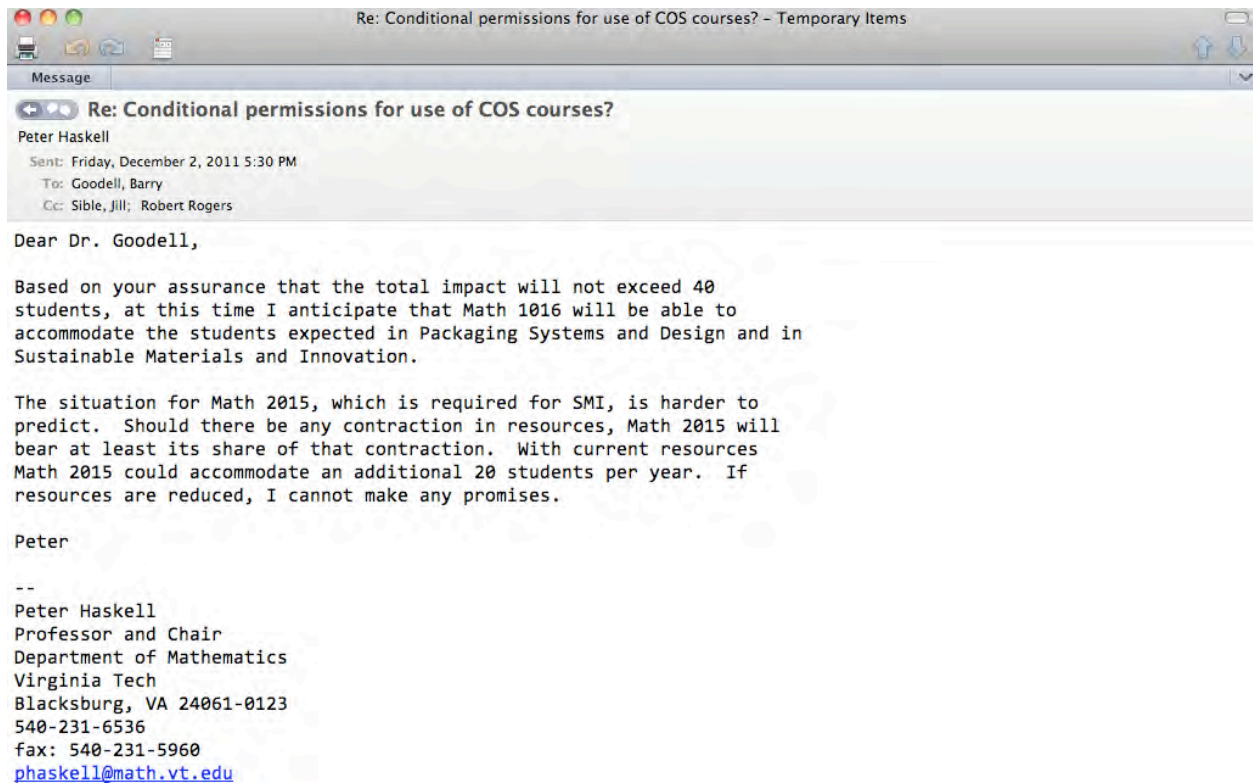
A handwritten signature in black ink, appearing to read "Richard A. Walker".

Richard A. Walker
Associate Head
Department of Biological Sciences

Invent the Future

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
An equal opportunity, affirmative action institution

Support for Math Department courses in the degree



Support for Statistics Department courses in the degree

RE: Conditional permissions for use of COS courses? - Temporary Items

Message

RE: Conditional permissions for use of COS courses?

Smith, Eric

Sent: Wednesday, December 7, 2011 5:16 PM

To: Goodell, Barry

Yes the wording is ok with Statistics

Eric smith

From: Goodell, Barry

Sent: Wednesday, December 07, 2011 4:28 PM

To: Smith, Eric

Subject: Re: Conditional permissions for use of COS courses?

Dear Eric,

I know that this is busy time of year, and I apologize for making this request now. I have heard back positively from two other COS department heads on the use of this conditional permissions language suggested by Jill Sible. Would you be willing to provide the same conditions permissions approval for our use of the STAT 2004, 3615 and 3616 courses as listed below in the degree proposals? Thank you for your help.

Barry Goodell

From: -- <goodell@vt.edu<<mailto:goodell@vt.edu>>>

Date: Fri, 2 Dec 2011 14:19:12 -0500

To: "Winkel, Brenda" <winkel@vt.edu<<mailto:winkel@vt.edu>>>, "Tanko, James" <jtanko@vt.edu<<mailto:jtanko@vt.edu>>>, "Haskell@math.vt.edu<<mailto:Haskell@math.vt.edu>>" <Haskell@math.vt.edu<<mailto:Haskell@math.vt.edu>>>, "Smith, Eric" <epsmith@vt.edu<<mailto:epsmith@vt.edu>>>, "Schmittmann, Beate" <schmittm@vt.edu<<mailto:schmittm@vt.edu>>>

Cc: "Sible, Jill" <siblej@vt.edu<<mailto:siblej@vt.edu>>>, "Stauffer, Dean" <dstauffe@vt.edu<<mailto:dstauffe@vt.edu>>>

Subject: Conditional permissions for use of COS courses?

Dear Brenda, Jim, Peter, Eric and Beate,

As some of you are aware, the department of Wood Science and Forest Products has three degree proposals moving through University Governance review. Two of the proposals are being considered within the Committee on Undergraduate Curricula (CUC) but currently they have been tabled because of the need for permissions from the home departments for our use of these courses. These proposed degrees are: 1) Sustainable Materials and Innovation and 2) Packaging Systems and Design.

I have listed the COS courses below by department for the two proposed degrees, and I am seeking permissions from each of you for use of the courses in our proposed curricula. The maximal number of students in each course from this degree would be 20 students/year.

Our Associate Dean, Dean Stauffer, has communicated with Jill Sible in COS, and Jill has suggested the language below that may be acceptable to you as a means of providing conditional permission, dependent on the availability of resources. If you are willing to provide the needed permissions, the use of language similar to this would be appropriate:

Permissions for use of the "course/lab will be available to students in the proposed degree provided there is sufficient enrollment support to meet course demand."

Please let me know if you would be willing to provide permission to allow our future students in these degrees access to your courses. Thank you.

Sincerely yours,

Barry Goodell
Head, Department of Wood Science and Forest Products
=====

Appendix E1 – Recent Job Openings related to Packaging Systems and Design in Virginia

https://sjobs.brassring.com/1033/ASP/TG/cim_jobdetail.asp?sec=1&partnerid=25153&siteid=5155&jobId=368840&Codes=INDEED. Accessed: February 25, 2011 11:23PM

| | |
|----------------------------------|---|
| Position Title | Lead Researcher, Packaging |
| Requisition Number | 1527BR |
| Business Unit Description | At MWV, we develop cutting edge packaging solutions and partner with the most trusted brands in the world to build brand value and engage consumers. We use our fresh insights, material innovations and global operations to design, manufacture and implement integrated packaging solutions for multiple industries. Want to work for a global company? We have 21,000 employees in 30 countries and serve our customers in more than 100 nations. And we were named to the Dow Jones Sustainability World Index for the sixth consecutive year. To learn more about MWV, please visit www.mwv.com . MWV is an Equal Opportunity Employer. |
| Posting Description | <p>CAREER OPPORTUNITY</p> <p>The Researcher provides technical support for MWV's Packaging Development R&D group in the innovation of converting and packaging processes, in the transformation of packaging form, filling and sealing systems and in the development of new packages.</p> <p>HOW YOU WILL IMPACT MWV</p> <ul style="list-style-type: none">• Perform wide range of testing and analysis on prototype packages. This includes barrier performance, package strength and stability characteristics, package and product compatibility, supply and distribution performance, and shelf life performance.• Support production of innovative packaging prototypes utilizing lab systems such as CAD tables, thermoformers, heat sealers, gluers, etc.• Support package converting trials on carton manufacturing, cup converting, blow molding, thermoforming, injection molding, and flexible packaging in the collection of operational data and package performance.• Support package filling and packing trials and evaluations in the collection of performance and operational data at customer plants• Assist engineers in the development and transformation of package form, fill and sealing systems to run new packages at a customer plants• Set up and conduct trials and tests on MWV's pilot packaging equipment.• Apply knowledge, experience and skills to the resolution of new package converting and packing problems• Maintain and recommend improvements or upgrades to packaging lab equipment• Work with outside vendors and suppliers in the evaluation of external materials and components for new packages• Provide comprehensive reports on all tests and evaluations <p>WHAT YOU NEED TO SUCCEED</p> <ul style="list-style-type: none">• 8-2+ years in Research and Development for consumer goods or packaging company• BS in Packaging Science or Mechanical Engineering• Technical Knowledge of packaging converting processes for one or more of the following: injection molding, blow molding, thermoforming, carton manufacturing, and flexible films• Understanding of the packaging supply chain and the fit for use criteria for primary, secondary and tertiary packaging |
| Country | United States of America |
| State/Province | Virginia |
| City | Richmond |
| Req. Type | Non-Exempt |
| Job Type | Full Time |

[Apply to job](#) [Send to friend](#) [Save to cart](#) [View similar jobs](#)

https://sjobs.brassring.com/1033/ASP/TG/cim_jobdetail.asp?sec=1&partnerid=25153&siteid=5155&jobId=365594&Codes=INDEED. Accessed: February 25, 2011 11:23PM

[Apply to job](#) [Send to friend](#) [Save to cart](#) [View similar jobs](#)

Sr. Packaging Development Scientist
1501BR

At MWV, we develop cutting-edge packaging solutions and partner with the most trusted brands in the world to build brand value and engage consumers. We use our fresh insights, material innovations and global operations to design, manufacture and implement integrated packaging solutions for multiple industries. Want to work for a global company? We have 21,000 employees in 30 countries and serve our customers in more than 100 nations. And we were named to the Dow Jones Sustainability World Index for the sixth consecutive year. To learn more about MWV, please visit www.mwv.com. MWV is an Equal Opportunity Employer.

CAREER OPPORTUNITY

Technical support for MWV's Packaging Development R&D group in the innovation of converting and packing processes, in the transformation of packaging form, filling and sealing systems and in the development of new packages.

HOW YOU WILL IMPACT MWV

- Perform wide range of testing and analysis on prototype packages. This includes barrier performance, package strength and stability characteristics, package and product compatibility, supply and distribution performance, and shelf life performance
- Support production of innovative packaging prototypes utilizing lab systems such as CAD tables, thermoformers, heat sealers, gluers, etc.
- Support package converting trials on carton manufacturing, cup converting, blow molding, thermoforming, injection molding, and flexible packaging in the collection of operational data and package performance
- Support package filling and packing trials and evaluations in the collection of performance and operational data at customer plants
- Assist engineers in the development and transformation of package form, fill and sealing systems to run new packages at a customer plants
- Set up and conduct trials and tests on MWV's pilot packaging equipment
- Apply knowledge, experience and skills to the resolution of new package converting and packing problems
- Maintain and recommend improvements or upgrades to packaging lab equipment
- Work with outside vendors and suppliers in the evaluation of external materials and components for new packages
- Provide comprehensive reports on all tests and evaluations

WHAT YOU NEED TO SUCCEED

- 4-5+ years in Research and Development for consumer goods or packaging company
- BS in Packaging Science or Mechanical Engineering Technology
- Knowledge of packaging converting processes for one or more of the following: injection molding, blow molding, thermoforming, carton manufacturing, and flexible films
- Understanding of the packaging supply chain and the fit for use criteria for primary, secondary and tertiary packaging
- Experience with packing lines and systems
- Experience with major packaging development or packaging systems projects
- Demonstrated mechanical skills and aptitudes and creative and innovative thinking
- Ability to work on cross functional teams and matrix organizations

United States of America
Virginia
Richmond
Exempt
Full Time

http://powerjobsdirect.com/view_job/post_id/2085-Packaging-Engineer?utm_source=Indeed&utm_medium=organic&utm_campaign=Indeed.

Accessed: February 25, 2011 11:23PM



Packaging Engineer

[Apply for this Job](#) | [Save this Job](#) | [ShareThis](#)

This position will be a part of the Operations Team and will be responsible for providing technical support for food packaging. Areas of focus will be based in supplier consistency, packaging quality, efficiencies, cost savings and sustainability

Develop packaging performance standards in line with packaging equipment tolerances and vendor capabilities. Develop and maintain packaging specifications in partnership with Supply Management and packaging vendors.

Perform life cycle analysis on packaging materials and develop metrics for measuring progressive improvements in consumption and waste stream reduction.

Leading efficiency and capacity continuous improvement projects

Design experiments; distribute test reports and packaging technical assessments in support of operations and new business objectives.

Lead root-cause analysis teams in the resolution of packaging material defects and operational impacts.

Identify and implement analytical procedures used in the assessment of packaging quality attributes, tolerances and design specifications.

Work in collaboration with Operations, Marketing, Supply Management and vendor partners in the development of innovations and custom packaging design solutions.

Research emerging technologies in the packaging material and packaging processing fields.

Requirements:

- Bachelor of Science in Packaging Engineering or equivalent combination of education and experience.
- 3-5 years experience in food packaging industry with emphasis on process and sustainable packaging solutions.
- Ability to lead complex projects in a fast paced and aggressive growth environment.
- Proven leadership in managing projects with cross functional teams focused on consumer-driven packaging solutions.
- Ambition to research and propose next-generation packaging breakthroughs.
- Experience with package reliability testing and failure analysis.
- Additional Skills/Experience:
 - Project management, Technical analysis, Statistical process control, and injection molded plastics.

Company Name:
PepsiCo Inc. 

Approximate Salary:
Not Specified

Location:
Colonial Heights, VA

Country:
United States

Industry:
Engineering

Position type:
Full Time

Experience level:
2 - 5 years

Education level:
Bachelor's Degree

ID
2085

[Apply for this Job](#)

Note: Some listings may also have apply info in the ad itself

<https://careers.thermofisher.com/viewjob.html?optlink-view=view-144783&ERFormID=newjoblist&ERFormCode=any>. Accessed: February 25, 2011 11:23PM

Job ID: AM20100510.61072

Requirements:

Expertise Engineering

Education Bachelors

Job Type Full-time

Location United States - Virginia - Middletown

Job Level Experienced

Description:

Position Summary:

Utilizes knowledge of engineering principles in connection with executing responsibilities, including process improvement, problem resolution, project management, and employee training.

- Provides support to manufacturing departments for the design, fabrication, modification, and evaluation of parts, assemblies, components, sub-assemblies, tooling, and final products.
- Provides support to manufacturing departments by collecting and processing information related to assigned projects, evaluating all information and alternatives, preparing and presenting plans, and recommending a course of action to management.
- Prepares cost estimates for labor, tooling, and equipment, and prepares appropriation requests.
- Coordinates manufacturing launch for new or revised products/processes, including the deployment and training of team members.
- Designs and/or procures equipment/machines/tools.
- Monitors performance of equipment/machines/tools and manufacturing processes.
- Evaluates and approves drawings, routings, manufacturing instructions, specs, and other documents.
- Prepares/manufactures prototypes and participates in design reviews, as required, utilizing the principles of concurrent engineering.
- Analyzes and solves a range of engineering problems from basic technical problems to complex problems that require: the analysis of situations or data; an in-depth evaluation of various factors; and/or a new, innovative approach or breakthrough in technology.
- Manages (i.e., plans, organizes, and executes) project assignments of varying complexity; prioritizes projects; determines project goals; maintains project schedule and tracks project milestones; selects methods and techniques to lead a project to completion; and evaluates outcomes.
- Assists Senior Manufacturing Engineer with manufacturing processes, line layouts, fixture design, equipment validations (IQ/OQ), FAT, capability studies, documentation, LEAN techniques, etc.
- Assists **Packaging** Engineering with design, development, improvement, and cost reduction of new and existing products.
- Develops compatible protective **packaging** for products.
- Assesses and resolves **packaging** problems arising in production or in the field.
- Creates engineering drawings or other **packaging** specifications.
- Develops and issues detailed specifications for procurement of **packaging** components.
- Directs the implementation of new or revised **packaging**.
- Develops pallet specifications for incoming **packaging** and outgoing product to maximize warehouse utilization and minimize shipping damage.
- Initiates studies designed to minimize **packaging** costs while maintaining or enhancing appearance.
- Meets plant individual performance expectation focusing on Quality, Safety and Delivery.
- Assures all teams are in the adherence to all Good Manufacturing Practice (GMP).
- Assures compliance with corporate site and regulatory policies, practices and guidelines.
- Performs other duties as assigned.

Minimum Requirements/Qualifications:

- Bachelor's degree in Mechanical Engineering or related field. Minimum 3 years experience in manufacturing engineering.

Physical Requirements:

- Business casual office environment
- Significant time each day spent in GMP manufacturing environment in which designated PPE will be required.
- Position will require sitting and standing.
- Employee may occasionally lift and/or move up to 50 pounds.

Non-Negotiable Hiring Criteria:

- Must be able to design and modify fixturing and equipment
- Must have experience with **packaging** processes, **packaging** equipment, and high volume automation
- Good organizational and project management skills
- Excellent problem solving and written/verbal communication skills
- Excellent computer skills (MSOffice® and MSProject®) to run data analysis of **packaging** solutions
- Working knowledge of mainframe MRP/ERP systems (SAP® is a plus)
- Working knowledge of engineering graphics, i.e. AutoCAD®, ProE®, Solid Works®

RELOCATION ASSISTANCE PROVIDED

http://www.careerbuilder.com/Jobseeker/Jobs/JobDetails.aspx?IPath=QHKCV0C&ff=21&APath=2.21.0.0.0&job_did=J8E75K6WLHZ4MQWLTHG. Accessed: February 25,

JOB OVERVIEW

| | |
|---|--|
| Company: Printpack Inc. | Job Type: Engineering Science Manufacturing |
| Location:  US-VA-Williamsburg | Req'd Education: Not Specified |
| Base Pay: N/A | Req'd Experience: Not Specified |
| Other Pay: | Req'd Travel: Not Specified |
| Employee Type: Full-Time | Relocation Covered: Not Specified |
| Manages Others: No | Industry: Manufacturing Other Great Industries Packaging |
| Reference ID: Not Available | |

JOB DESCRIPTION

Printpack is seeking a qualified candidate to fill the position of **Research Engineer I or II** (commensurate with qualifications and experience). This position will be located in Williamsburg, VA and report to the Division Research Manager.
Relocation assistance not provided.

Requirements:

- Masters Degree in Engineering or Science. Chemical, Polymer or Packaging degree is preferred
- Two or more years of research and industry experience is preferred
- Experience of injection molding and extrusion blow molding technology is a plus

Objectives and Areas of Focus

- Identify, evaluate and develop new materials and process technologies to develop novel rigid food packaging and package system solutions
- Develop technologies that provide strategic market advantages and are protected by strong IP positions
- Evolve understanding of food processing effects on rigid plastic container performance.
- Understanding of food science is a plus
- Thermal and non thermal food processing
- Test methods and apparatus that replicate customer processes
- Assess gaps associated with existing package technologies and act as systems integrator to develop unique solutions
- Work closely with engineering, product development, sales & marketing and customer to commercialize new technologies
- Support engineering and product development in commercial product problem solving

This position requires strong skills in the following areas:

- Teamwork
- Integrity
- Judgment
- Information Gathering
- Problem Analysis
- Management Control
- Written Communication Skills/Oral Communication Skills
- Technical Skill and Competence
- Commercial Orientation
- Cross Functional Awareness
- Innovation
- Decisiveness
- Initiative
- Persuasiveness
- Concern for Excellence
- Customer Service Orientation
- Execution

2011

<http://www.engineer-jobs.com/job.asp?id=30532130&aff=AC44BA2E-E3EB-4DBC-8BDB-9FCE01C58B09>. Accessed: February 25, 2011 11:23PM

Shift Leader

Job Number: 30532130
Company Name: Honeywell
Location: Hopewell, VA US
Salary:
Career Focus: Engineering & Architecture

Apply to Job

Updated: 2/3/2011

Shift Leader

Title: Shift Leader
Location: VA-Hopewell
Join a team in a role that offers a broad array of challenges with limitless possibilities for personal development and professional growth opportunities!

Resins and Chemicals manufactures a wide variety of intermediate products, including nylon feedstock caprolactam, nylon resin, ammonium sulfate fertilizers, and specialty polymers, as well as carbon dioxide, sulfuric acid and anhydrous ammonia.

Caprolactam and Chemical Intermediates -- Honeywell makes caprolactam to produce textile, carpet and industrial fibers, as well as engineered plastics and specialty films. Nadone® cyclohexanone is produced to exacting standards for internal consumption as well as for merchant sale. Naxol® cyclohexanol is ideal for use in the production of cyclohexylamine and nylon as well as agricultural products, rubber chemicals, plasticizers and solvent applications.

Aegis Nylon Resin -- Honeywell develops and manufactures Aegis® nylon resins for demanding applications in flexible packaging and injection molding. Aegis nylon packaging resins are available in a wide array of configurations. Aegis nylon 6 resins can be found in a wide array of applications, including food packaging, consumer packaging, and injection molding.

An immediate opening is available for a Shift Leader at the Hopewell, VA Facility.

Job Responsibilities:

- * Reinforce safety practices on a daily basis and fully support the Behavioral Based Safety Program.
- * Supervise departmental safety and housekeeping practices and maintain a constant alert for hazardous conditions.
- * Ensure compliance with applicable laws and regulations issued by OSHA, EPA, and other federal, state, and local regulatory agencies.
- * Respond to employee injuries by investigating accident causes and recommending means to prevent accident reoccurrence.
- * Reinforce quality in all manufacturing processes and ensure that all employees follow established manufacturing guidelines.
- * Increase yields by working individually or on teams to resolve problems.
- * Look for continuous improvement opportunities in manufacturing practices to reduce cycle time and/or cost and improving on-time delivery.
- * Facilitate and coach employees and work teams to achieve cell/shift/plant goals and objectives.
- * Plan, supervise, direct and engage in daily production operations and anticipate production problems, (i.e. material shortages, equipment malfunctions, rush orders, etc.) such that loss of work hours is minimized and production and quality objectives are achieved.
- * Utilize skills, work hours, materials, and work flow to achieve production.
- * Exchange timely information with other supervisors on interdepartmental product flow and work force needs.
- * Disseminate information to employees within work center on a regular basis using effective verbal and nonverbal communication skills.
- * Perform administrative activities necessary for the effective management of the department.
- * Effectively set expectations, select, develop, train, and motivate employees to acquire maximum efficiency, productivity, cooperation, and morale.
- * Maintain total awareness to all plant policies, regulations, and procedures, and ensures proper adherence to them with respect to all operations.
- * Effectively assess and differentiate subordinate performance through performance feedback, merit planning, and reward and recognition systems.
- * Address substandard performance in a fair and timely manner. Coach and mentor subordinates for personal and professional development.
- * Create a positive work environment; role model the Honeywell Behaviors and Code of Business Conduct.
- * Develop and recommend budgetary guidelines and spending levels to insure a cost-effective operation of all assigned production

Appendix E2 – Recent Job Openings related to Sustainable Packaging in the U.S.

<http://jobview.monster.com/Packaging-Engineer-Job-Sanford-NC-96784384.aspx>,

Accessed: February 17, 2011 11:15AM

Job Summary

Company

Coty

Location

Sanford, NC

Industries

Manufacturing - Other

Job Type

- Full Time
- Employee

Years of Experience

2+ to 5 Years

Education Level

Bachelor's Degree

Career Level

Experienced (Non-Manager)

Packaging Engineer

About the Job

COTY US in Sanford, NC (located 40 miles south of Raleigh), one of the world's largest manufacturers and distributors of fine fragrances and cosmetics has the following career opportunity immediately available.

PACKAGING ENGINEER

The Technical Package Development (TPD) Packaging Engineer will support the successful introduction of saleable and promotional initiatives by ensuring their design corresponds with plant machinery and procedures, maintaining the quality of the product for the consumer. Support existing business through package revisions, defect analysis and cost improvement projects. Facilitate launch activities and priorities, and participate in supplier selection. Collaborate with internal departments and/or suppliers to determine feasibility of new packaging related to functionality, compatibility and quality. Ensure launch quality and design integrity, on time, and within agreed upon cost objectives. Continually optimize current products and processes. Oversee final approvals provided for each new launch component following test methods and protocols. Investigate alternative package designs to reduce costs and increase line efficiency. Seek new ideas and innovation from strategic suppliers for Coty's exclusive use. Resolve component and specification issues for ongoing packages. Travel to component vendors, outside contractors, Coty global offices and other sites as needed. Manage new and ongoing projects in support of the manufacturing location to guarantee compliance and adherence to cGMP guidelines. Collect and evaluate data for packaging sustainability and value added projects. Work collaboratively with R&D, Package Concept Development, Marketing, Procurement and Manufacturing.

Requirements – PLEASE READ THE REQUIREMENTS CAREFULLY

- Degree in Packaging Engineering or Equivalent
- Minimum 3 years in Package Development or Equivalent
- 3+ years professional experience in cosmetics/pharmaceutical/consumer packaged goods company
- Broad range of technical skills, including experience in all phases of product/technology development from concept to commercialization
- Must have excellent written and verbal communication skills and be able to communicate effectively with technical and non-technical personnel at all levels of the organization
- Analytical approach, problem solving, data analysis and information gathering
- Strong project management and presentation skills
- Experience analyzing potential savings possibilities, establishing action plans, and guaranteeing follow-up and efficiency.
- Highly proficient in use of Word, Excel, PowerPoint, Adobe, SPC, Visio, ETQ and Access
- Excellent organizational skills and attention to detail to manage the documentation, materials and information load

If you meet all of the requirements above, please visit our careers page at www.coty.com to apply.

[Report this job](#) [Send this job to a friend](#) [See all Bristol-Myers Squibb opportunities](#)



[Our Company](#)

[Our Culture](#)

[Our Benefits](#)

Together we can prevail.

Meet Our People

[click here](#)

Meet Our Patients

[click here](#)

INSPIRE
BE INSPIRED.
INNOVATION. ACHIEVEMENT. PASSION.

Position Information

Company:

Bristol-Myers Squibb

Location:

New Brunswick, NJ 08901

Job status/type:

Full Time Employee

Job category:

Manufacturing/Production/
Operations

Career level:

Manager (Manager/Supervisor of
Staff)

Over the years, Bristol-Myers Squibb and its employees have received numerous distinguished awards and recognitions.

For a complete list of our awards and company benefits, please visit our website.

TOP 50
ORGANIZATIONS
FOR DIVERSITY



Bristol-Myers Squibb - A Next-Generation BioPharma Leader

We are a team dedicated to **discovering, developing and delivering innovative medicines that help patients prevail over serious diseases**. Our commitment is to foster a globally diverse and inclusive workforce with a high-performing culture that is agile, entrepreneurial and accountable. This enables our business strategy while encouraging excellence, growth, achievement, innovation and a balance between our personal and professional lives.

By combining the reach and resources of a global pharmaceutical company with the can-do spirit and agility of a biotechnology company, we are becoming a leader for the future – a **next-generation BioPharma leader**.

ASSOCIATE DIRECTOR PACKAGING TECHNOLOGY

Summary/Description:

The successful candidate will lead a team that designs and develops creative and cost effective package systems for new and existing products. The candidate will manage a team of engineering professionals that are responsible for the identification, development and deployment of anti-counterfeiting and tamper evident technologies on packaging. In addition, a strong focus will be placed on developing and evaluating new packaging technologies to meet business objectives as well as productivity and cost improvement programs. The candidate will also be responsible for the development and implementation of global standards to enable serialization such as 2D barcodes, RFID and EPCIS systems. Additional duties including packaging **sustainability** programs, laboratory management and capital project leadership may be delegated at the discretion of the supervisor.

Bachelors Degree or equivalent in Package Engineering, Mechanical Engineering, or related fields. Masters a plus. Ten plus years of Package Development or related experience, preferably in a pharmaceutical environment. The candidate will be responsible for leading a staff of highly qualified packaging and mechanical engineers. The candidate should have 5 years minimum experience in supply chain security methods and best practices for safe transport of raw materials, work in progress and finished goods. The candidate must be an effective project manager and team leader with experience in leading cross functional teams with members of diverse backgrounds. Good oral and written communication skills are required, as well as the ability to work with external groups and suppliers to successfully deliver results with high integrity.

[Apply Here](#)



About Shearer's Foods, Inc.

Shearer's Foods, Inc. is a privately held producer and marketer of quality snack foods sold under the Shearer's brand, as well as other "private labels." Additionally, we utilize our unique manufacturing expertise and serve as a strategic supplier to other nationally recognized brands. With exceptional competence in product development, manufacturing, marketing, and distribution, we continue to realize significant growth in each segment of our business. We are headquartered in Brewster, Ohio, and have locations in five states. Visit our website at www.shearersfoodsinc.com.

POSITION DESCRIPTION

Packaging Specialist

Shearer's Foods is a privately held producer and marketer of quality snack foods sold under the Shearer's brand, as well as other "private labels." Additionally, we utilize our unique manufacturing expertise and serve as a strategic supplier to other nationally recognized brands. With exceptional competence in product development, manufacturing, marketing, and distribution, we continue to realize significant growth in each segment of our business. We are headquartered in Brewster, Ohio, and have locations in five states. Visit our website at www.shearers.com.

Career Opportunity: Packaging Specialist, Brewster

SUMMARY:

Coordinate and execute the functional activities and responsibilities associated with the technical packaging development of Shearer's successful food products.

ESSENTIAL DUTIES AND RESPONSIBILITIES:

include the following. Other duties may be assigned.

- Support the execution of successful packaging engineering including flexible packaging solutions, corrugated cases, display ready shippers, inner and master pack solutions and more.
- Coordinate the launch and development of new products' packaging.
- Be a resource to enable successful active product packaging changes including rolling transitions and hard changes.
- Serve as facilitator for packaging knowledge needs with internal (inter-departmental) and external (retail/trade) customers.
- Learn and execute processing and production techniques that contribute to achieving successful product packaging development. The ability to develop packaging solutions with mindfulness towards costs and operational efficiencies is an important responsibility of this position.
- Contribute to the development, management and tracking of products' technical packaging specifications including labeling, palletizing, corrugated, oxygen/moisture barrier needs, and more.
- Provide technical product packaging support to sales team. Work with Shearer's internal marketing team to help position products for market.
- Work with management to complete product packaging projects on time, on budget and on target.
- Work with Technical Product Manager to collaborate with Shearer's external suppliers to solve challenges and contribute to Shearer's commitment to ongoing improvement including cost reduction, [\[REDACTED\]](#) (and resource conservation), and improved quality.
- Support all efforts to achieve Shearer's product objectives.
- Travel as needed to support sales, marketing or packaging development needs.
- Embrace other assignments as needed and required.

SUPERVISORY RESPONSIBILITIES:

Poses the ability to manage both internal and external customers and to assess and manage employee.

QUALIFICATIONS: To perform this job successfully, an individual must be able to perform each essential duty satisfactorily. The requirements listed below are representative of the knowledge, skill and/or ability required. Reasonable accommodations may be made to enable individuals with disabilities to perform the essential duties.

- A baccalaureate or masters degree in packaging science or related engineering field is required.
- Experience in food or other perishable products is a plus.
- Strong written and verbal skills are required.
- Good math and quantitative skills are essential.
- Have and use good common sense.
- A valid driver's license is required.

The physical demands described here are representative of those that must be met by an employee to successfully perform the essential functions of the job. Reasonable accommodations may be made to enable individuals with disabilities to perform the essential functions. This position can involve some moderate lifting of boxes and displays. Moving and standing for moderate to extended periods of time while working in sometimes loud and non-climate control facilities will be necessary to accomplish job objectives.

The work environment characteristics described here are representative of those an associate encounters while performing the essential functions of the job. Reasonable accommodations may be made to enable individuals with disabilities to perform the essential functions. This position will require working in both an office and a sometimes loud, non-climate controlled manufacturing environment.

To apply, please follow this link to our on line application process:

<https://home.atas.com/casult/?id=564356>
Shearer's Foods is an equal opportunity employer
Shearer's Foods does not hire users of ANY tobacco products

Appendix F – Student Survey Results

Virginia Tech University Studies Student Survey:

Students from the University Studies program at Virginia Tech were provided a question (below) as part of a survey administered by University Studies staff in May and June of 2011. Responses to the question revealed that approximately 30% of the US students would have moderate to strong interest in a degree in Packaging Systems and Design. The survey was taken by 114 subjects. Extrapolation to the approximate 2,500 student enrollment in University Studies suggests that as many as 750 University Studies students would potentially have interest if this major were offered on campus.

If a "Packaging Systems and Design" degree was offered at Virginia Tech would that be of interest to you as a student?

Definitely 1 (1%)

Highly likely 8 (7%)

Somewhat likely 25 (22%)

Unlikely 50 (44%)

Definitely would not 29 (25%)

no answer 1 (1%)

Background on the survey subjects:

Sex:

Male 57 (50%)

Female 56 (49%)

no answer 1 (1%)

Age:

16-20 110 (96%)

21-25 3 (3%)

26-30 0 (0%)
30-40 0 (0%)
Over 40 0 (0%)
no answer 1 (1%)

Interested in the environment?

Yes 99 (87%)
No 13 (11%)
no answer 2 (2%)

Hometown:

Instate 77 (68%)
Out-of-State 32 (28%)
non-US born 3 (3%)
no answer 2 (2%)

Languages spoken besides English:

Spanish 18 (16%)
French 4 (4%)
Chinese 3 (3%)
German 0 (0%)
none 63 (55%)
other: 9 (8%)
no answer 17 (15%)

Appendix G – Inquiries and Expressions of Interest from Potential Students

From: James Lassiter <j17lassi@vt.edu>
Sent: Monday, February 28, 2011 3:51 AM
To: Horvath, Laszlo
Subject: packaging degree

I believe the Packaging Science Option in the Department of Wood Science and Forest Products deserves its own separate degree. I fully understand that the most widely used material in packaging is wood but packaging is so broad that many packaging companies that are looking for students to hire are not looking for wood experts. Packaging is the third largest industry in the world and is so broad that one can get an entire education in just one aspect of packaging.

I do not know exactly what the current degree for a Packaging Option major in Wood Science actually says but I am told it does not look favorable when peered upon by industry employers. The last thing I want is to miss out on an opportunity at a great job because my degree is misleading. As president of the Institute of Packaging Professionals (Student Chapter) at Virginia Tech and lab technician for the Center for Unit Load Design at Virginia Tech, I would like the degree I work incredibly hard to achieve to accurately reflect the experience and education I have received. Being president of IoPP at Virginia Tech means I am one of the few packaging undergrads that the other students can look to for leadership in this confused time. I can safely assure that I want the best for myself and my colleagues.

The last thing I want to hear is that myself or my friends and classmates have been overlooked either during an interview, or prior to, because an employer was confused by the name of our degree. The packaging program is picking up a great deal of momentum and our ambitious, new professors plan to take the program passed its potential. When the Packaging Science Option expands in students and curriculum, there will be further issues as to why these students coming to this school and this major are being passed up by industry for a Michigan State student or a Clemson student because their degrees describe their education in a more accurate manner. This is currently a threat that I, myself am currently worried about.

Please, grant us this justice and help us succeed even further in the world. For those who recognize the potential as well as we students that have the capacity and chance to do great things in the world, don't let us be deterred by simple yet profound misunderstandings. As president of a small, humble, yet determined body of students, I ask that we are granted a properly named degree.

Sincerely,

James Lassiter

Senior, President of IoPP at Virginia Tech (Student Chapter)

From: Zach Cogan [zcogan1@vt.edu]
Sent: Monday, February 28, 2011 11:46 AM
To: Kim, Young Teck
Subject: Letter of Concern

To whom it may concern,

Please consider our request as packaging science students to branch out from underneath the Wood Science Major and create a separate major for Packaging Systems and Design. As a packaging designer, it is important to distinguish ourselves from wood science and other majors because the criteria and subject matter is that much different. As packaging students we learn about systems as well as the various types of packaging in the industry. In order to compete with other top packaging schools in the industry, it is important to get our name out here at Virginia Tech. Creating a separate curriculum and major that is still underneath the wood science department would help us achieve this goal. The majority of our core classes are packaging related and have little relevance to wood science. Its nice to have a foundation in wood classes for sustainability and pallet design, but overall, packaging is a field of its own.

Thank you for your consideration,
Zach Cogan

From: Tyler Matusevich [tylerm5@vt.edu]
Sent: Tuesday, March 01, 2011 8:50 AM
To: Kim, Young Teck
Subject: packaging major

We need a packaging program separate from wood science and forest products because we feel as if it should be its own major. It is its own major at Michigan State and has been for a long time. We want to be able to compete in the job industry with those guys and when we are looking for a packaging job and we say we were Wood science and forest products major with packaging science option; that could throw them off especially if we're competing with a Michigan State person who's major is Packaging Science with a design option or food packaging option. We also feel like our major is growing and needs to be recognized as its own thing. There is an increasing need for packaging professionals and is the 3rd largest industry in the world. Everything needs a package.

Tyler Matusevich

From: remmersj@vt.edu [remmersj@vt.edu]
Sent: Thursday, March 03, 2011 11:19 AM
To: Kim, Young Teck
Subject: Supportive Letter

Dear Dr, Kim,

As a Packaging minor student, I believe that it is imperative for the Department of Wood Science to enhance the Packaging program to allow a more comprehensive course schedule. For future career opportunities, I believe that if the department separates the Packaging option and offers select classes for a degree, then there would be a higher potential of finding a high paying job upon graduation. As of now, my degree title as a Packaging minor student would not be as beneficial to me when I approach the working field compared to if the Department specified and narrowed the Packaging science into once major section in the Wood Science Department. If this change occurred, the classes and description of my degree would greatly benefit my knowledge as a Packaging student, and it will also greatly aid my drive to work in the Packaging sector upon graduation. Thank you for your time.

Best,

Julie Remmers

Appendix H - NAICS Descriptions

Definition: NAICS 3222 Converted paper product manufacturing

This industry group comprises establishments primarily engaged in converting paper or paperboard without manufacturing paper or paperboard.

Definition: NAICS 32611 Unsupported Plastics Film, Sheet, and Bag Manufacturing

This industry comprises establishments primarily engaged in (1) converting plastics resins into unsupported plastics film and sheet and/or (2) forming, coating or laminating plastics film and sheet into plastics bags.

Definition: NAICS 54143 Graphic design services

This industry comprises establishments primarily engaged in planning, designing, and managing the production of visual communication in order to convey specific messages or concepts, clarify complex information, or project visual identities. These services can include the design of printed materials, packaging, advertising, signage systems, and corporate identification (logos). This industry also includes commercial artists engaged exclusively in generating drawings and illustrations requiring technical accuracy or interpretative skills.

Definition: NAICS 326160 Plastics Bottle Manufacturing

This industry comprises establishments primarily engaged in manufacturing plastics bottles.

Definition: NAICS 56191 Packaging and labeling services

This industry comprises establishments primarily engaged in packaging client-owned materials. The services may include labeling and/or imprinting the package.

Definition: NAICS 32611 Plastics Packaging Materials and Unlaminated Film and Sheet Manufacturing

This industry comprises establishments primarily engaged in (1) converting plastics resins into unsupported plastics film and sheet and/or (2) forming, coating or laminating plastics film and sheet into plastics bags.

Definition: NAICS 493 Warehousing and Storage

Industries in the Warehousing and Storage subsector are primarily engaged in operating warehousing and storage facilities for general merchandise, refrigerated goods, and other warehouse products. These establishments provide facilities to store goods. They do not sell the goods they handle. These establishments take responsibility for storing the goods and keeping them secure. They may also provide a range of services, often referred to as logistics services, related to the distribution of goods.

Logistics services can include labeling, breaking bulk, inventory control and management, light assembly, order entry and fulfillment, packaging, pick and pack, price marking and ticketing, and transportation arrangement. However, establishments in this industry group always provide warehousing or storage services in addition to any logistic services. Furthermore, the warehousing or storage of goods must be more than incidental to the performance of services, such as price marking.

333993 Packaging Machinery Manufacturing

This U.S. industry comprises establishments primarily engaged in manufacturing packaging machinery, such as wrapping, bottling, canning, and labeling machinery.

Definition: NAICS 311 Food manufacturing

Industries in the Food Manufacturing subsector transform livestock and agricultural products into products for intermediate or final consumption. The industry groups are distinguished by the raw materials (generally of animal or vegetable origin) processed into food products.

The food products manufactured in these establishments are typically sold to wholesalers or retailers for distribution to consumers, but establishments primarily engaged in retailing bakery and candy products made on the premises not for immediate consumption are included.

Appendix I - Occupational Descriptions

Food scientists and technologists usually work in the food processing industry, universities, or the Federal Government to create and improve food products. They use their knowledge of chemistry, physics, engineering, microbiology, biotechnology, and other sciences to develop new or better ways of preserving, processing, packaging, storing, and delivering foods

Food technologists generally work in product development, applying the findings from food science research to improve the selection, preservation, processing, packaging, and distribution of food

Materials chemists study and develop new materials to improve existing products or make new ones. In fact, virtually all chemists are involved in this quest in one way or another.

Materials scientists study the structures and chemical properties of various materials to develop new products or enhance existing ones. They also determine ways to strengthen or combine materials or develop new materials for use in a variety of products. Materials science encompasses the natural and synthetic materials used in a wide range of products and structures, from airplanes, cars, and bridges to clothing and household goods. Materials scientists often specialize in a specific type of material, such as ceramics or metals.

Industrial engineers determine the most effective ways to use the basic factors of production—people, machines, materials, information, and energy—to make a product or provide a service. They are concerned primarily with increasing productivity through the management of people, methods of business organization, and technology. To maximize efficiency, industrial engineers study product requirements carefully and then design manufacturing and information systems to meet those requirements with the help of mathematical methods and models. They develop management control systems to aid in financial planning and cost analysis, and they design production planning and control systems to coordinate activities and ensure product quality. They also design or improve systems for the physical distribution of goods and services and determine the most efficient plant locations. Industrial engineers develop wage and salary administration systems and job evaluation programs. Many industrial engineers move into management positions because the work is closely related to the work of managers.

Materials engineers are involved in the development, processing, and testing of the materials used to create a range of products, from computer chips and aircraft wings to golf clubs and snow skis. They work with metals, ceramics, plastics, semiconductors, and composites to create new materials that meet certain mechanical, electrical, and chemical requirements. They also are involved in selecting materials for new

applications. Materials engineers have developed the ability to create and then study materials at an atomic level, using advanced processes to replicate the characteristics of those materials and their components with computers. Most materials engineers specialize in a particular material. For example, metallurgical engineers specialize in metals such as steel, and ceramic engineers develop ceramic materials and the processes for making them into useful products such as glassware or fiber-optic communication lines. Appendix K - Occupational Employment in the U.S. 2008-2018 Projection for Industrial Engineers

Source: Bureau of Labor Statistics. Occupational Outlook Handbook, 2010-2011. Available at: ftp://ftp.bls.gov/pub/special.requests/ep/ind-occ.matrix/occ_pdf/occ_17-2112.pdf. Downloaded February 26, 2011

| Industry | NAICS Code | Employment 2008 | Projected Employment 2018 | Percent Change, 2008-18 |
|--|------------|-----------------|---------------------------|-------------------------|
| Food Manufacturing | 311 | | | |
| Food Scientist | | 5300 | 5800 | 7.73 |
| Converted Paper product manufacturing | 3222 | | | |
| Industrial Engineer | | 1800 | 1600 | -7.98 |
| Industrial Design | | 500 | 400 | -22.13 |
| Materials Engineer | | 100 | 100 | -12.18 |
| Pharmaceutical and Medicine Manufacturing | 3254 | | | |
| Industrial Engineer | | 3100 | 3700 | 19.97 |
| Material Scientist | | 800 | 900 | 13.21 |
| Warehousing and storage | 4930 | | | |
| Industrial Engineer | | 800 | 1000 | 29.36 |
| Plastic Product Manufacturing | 3261 | | | |
| Chemist | | 200 | 200 | -4.51 |
| Materials Engineer | | 300 | 300 | 3.92 |
| Scientific research and development services | 5417 | | | |
| Industrial Engineer | | 8600 | 12400 | 44.31 |
| Material Scientist | | 2600 | 3200 | 26.54 |
| Other general purpose machinery manufacturing | 3339 | 3600 | 3800 | 5.68 |
| Industrial Engineer | | 3600 | 3800 | 5.68 |
| Industrial Design | | 500 | 400 | -11.11 |

Appendix L – Description of CIP Code

Source: <http://nces.ed.gov/ipeds/cipcode/cipdetail.aspx?y=55&cipid=89360>

Detail for CIP Code 15.1503 (2010)

Title: Packaging Science.

Definition: A program that focuses on the application of scientific, technological, design, and business principles to the development of packages and packaging materials, including raw material production, conversion of raw materials into usable forms, design, distribution, and post-use recycling and reuse. Includes instruction in principles of packaging, materials sciences, distribution and transportation, engineering and technology, graphic design, packaging regulations, and business and marketing

Appendix K– Curricula of Major U.S. Packaging Programs

Michigan State University – B.S. in Packaging Science. Source: http://www.packaging.msu.edu/resource/resmgr/docs/curriculum_guide.pdf. Accessed: March 1, 2011



Curriculum Guide Bachelor of Science Degree in Packaging

UNIVERSITY REQUIREMENTS IN INTEGRATIVE STUDIES:

Total = 28 credits. (IS General Science Alternate Track = CEM 141, CEM 143, CEM 161; FSC 342 or MMG 201)

| | Credits | Semester Offered | | |
|--|---------|------------------|--------|--------|
| | | Fall | Spring | Summer |
| Tier I Writing (WRA) | 4 | XX | XX | XX |
| Integrative Studies, Arts & Humanities (IAH) | 8 | XX | XX | XX |
| Integrative Studies, Social Science (ISS) | 8 | XX | XX | XX |
| Additional University Requirements met by college/school requirements. | | | | |

COLLEGE REQUIREMENTS:

| | | | | |
|--|---|----|----|----|
| EC 201 Introduction to Microeconomics (<i>preferred for PKG</i>) or EC 202 Introduction to Macroeconomics | 3 | XX | XX | XX |
| Mathematics; met by school requirements | 3 | XX | XX | XX |
| 26 credits in College of Natural Resources, met by course work in the Packaging Core | | | | |

SCHOOL REQUIREMENTS:

| | | | | |
|--|---|----|----|----|
| BS 110 Organisms and Populations or BS 111 Cells and Molecules or FSC 342 Food Safety & HACCP or MMG 201 Fundamentals of Microbiology | 4 | XX | XX | |
| CEM 141 General Chemistry | 3 | XX | XX | XX |
| CEM 143 Survey of Organic Chemistry | 3 | XX | | |
| CEM 161 Chemistry Laboratory I | 4 | XX | XX | |
| MTH 124 Survey of Calculus with Applications I or MTH 132 Calculus I | 4 | XX | XX | |
| PHY 231 Introductory Physics I or PHY 183 Physics for Scientists & Engineers I | 1 | XX | XX | |
| PHY 232 Introductory Physics II or PHY 184 Physics for Scientists & Engineers II | 3 | XX | XX | XX |
| STT 200 Statistical Methods or STT 201 Statistical Methods or STT 315 Introduction to Probability & Statistics for Business | 3 | XX | XX | XX |
| | 4 | XX | XX | XX |
| | 3 | XX | XX | XX |
| | 4 | XX | XX | XX |
| | 3 | XX | XX | XX |

BUSINESS COGNATE:

| | | | | |
|--|---|----|----|----|
| ACC 230 Survey of Accounting Concepts | 3 | XX | XX | XX |
| Three of the following choices: | | | | |
| ADV 205 Principles of Advertising | 4 | XX | XX | XX |
| FI 320 Introduction to Finance | 3 | XX | XX | |
| GBL 323 Introduction to Business law | 3 | XX | XX | |
| MGT 325 Management Skills and Processes | 3 | XX | XX | XX |
| SCM 303 Introduction to Supply Chain Management (SCM 303 effective F509) | 3 | XX | XX | XX |
| MKT 327 Introduction to Marketing (MKT 327 effective F509) | 3 | XX | XX | XX |

PACKAGING CORE:

| | | | | |
|--|---|----|----|----|
| PKG 101 Principles of Packaging | 3 | XX | XX | XX |
| PKG 221 Packaging with Glass and Metal (<i>Pr: PKG 101 or concurrent, CEM 141, PHY 231</i>) | 3 | XX | XX | |
| PKG 315 Packaging Decision Systems (<i>Pr: MTH 116, MTH 124 and completion of Tier I writing requirement</i>) (PKG majors) | 3 | XX | XX | |
| PKG 322 Packaging with Paper and Paperboard (<i>Pr: PKG 101, PKG 221 or concurrent, CEM 143, MTH 124, STT 200, 201, or 315</i>) (PKG majors) | 4 | XX | XX | |
| PKG 323 Packaging with Plastics (<i>Pr: PKG 101, PKG 221 or concurrent, CEM 143, MTH 124, STT 200, 201, or 315</i>) (PKG majors) | 4 | XX | XX | |
| PKG 410 Distribution Packaging Dynamics (<i>Pr: PKG 322, PKG 323</i>) (PKG majors) | 3 | XX | XX | |
| PKG 432 Packaging Processes (<i>Pr: PHY 232, PKG 322, PKG 323</i>) (PKG majors) | 4 | XX | XX | |
| PKG 485 Packaging Development (<i>Pr: PKG 315, PKG 410, PKG 432, completion of Tier I writing requirement</i>) (PKG majors) | 4 | XX | XX | |

PACKAGING ELECTIVE REQUIREMENTS:

| | | | | |
|--|---|----|----|----|
| Packaging Elective Credit (See courses on reverse side.) | 6 | XX | XX | XX |
|--|---|----|----|----|

SUFFICIENT FREE ELECTIVE CREDITS TO BRING TOTAL TO 120 (123 IF MTH 1825 TAKEN)

PACKAGING ELECTIVES

| | Credits | Fall | Spring | Summer |
|--|---------|------|--------|--------|
| PKG 330 Package Printing (Pr: PKG 221; PKG majors) | 3 | XX | | |
| PKG 370 Packaging and the Environment (Pr: CEM 141, Tier I writing course) | 3 | | XX | |
| PKG 440 Robotics & Automotive Packaging (Pr: MTH 124; Juniors or above) | 3 | XX | | |
| PKG 444 Radio Frequency Identification (RFID) for Packaging (Pr: PKG 322 and 323 or approval of the School) | 3 | XX | XX | |
| PKG 450 Automotive and Industrial Packaging (Pr: MTH 124 or MTH 132 or LB 118 or MTH 152H) | 2 | XX | | |
| PKG 452 Medical Packaging (Pr: PKG 322 or 323) | 4 | XX | | |
| PKG 455 Food Packaging (Pr: PKG 322 and 323; PKG majors) | 3 | | XX | |
| PKG 460 Distribution Packaging and Performance Testing (Pr: PKG 410) | 3 | | XX | |
| PKG 475 Packaging Economics (Pr: EC 201 or 202) | 3 | XX | | |
| PKG 477 Hazardous Materials Packaging (Recommended background PKG 322 and PKG 323) | 3 | | XX | |
| PKG 480 Packaging Laws and Regulations (Pr: PKG 322 or 323; PKG majors) | 3 | | XX | |
| * PKG 490 Special Problems in Packaging (Independent Study) (Pr: PKG 322 and 323; PKG majors, application, School approval) (A student may earn a maximum of 6 credits in all enrollments for this course) | 1-3 | XX | XX | XX |
| PKG 491 Special Topics (includes Study Abroad) (A student may earn a maximum of 8 credits in all enrollments for this course) | 1-4 | XX | XX | XX |
| * PKG 492 Senior Seminar (Pr: PKG majors, Seniors) | 1 | XX | XX | |
| PKG 493 Packaging Internship (Pr: PKG 315, PKG 322 and 323; Juniors and above, PKG majors, application, School approval) (Only one internship to count towards required packaging electives.) (A student may earn a maximum of 6 credits in all enrollments for this course) | 3 | XX | XX | XX |

*May not be used to meet Packaging Electives requirement.

A MAXIMUM OF 47 CREDITS MAY BE EARNED IN ALL PACKAGING (PKG) COURSES.

SAMPLE PACKAGING CURRICULUM GUIDE

| FRESHMAN | SOPHOMORE | JUNIOR | SENIOR |
|-----------------|-----------------|-----------------|-------------------|
| WRA 1xx 4 | PHY 231 3 | PKG 315 3 | PKG 432 4 |
| MTH 116 5 | ISS 3xx 4 | PKG 322 4 | BUS Cognate II 3 |
| PKG 101 3 | ACC 230 3 | PKG 323 4 | PKG Elective I 3 |
| EC 201 or 202 3 | Electives 6 | PHY 232 3 | Electives 5 |
| 15 | 16 | Electives 1 | 15 |
| | | 15 | |
| CEM 141 4 | PKG 221 3 | MMG 201 3 | PKG 485 4 |
| CEM 161 1 | IAH 2xx 4 | PKG 410 3 | BUS Cognate III 3 |
| IAH 20x 4 | STT 200 3 | BUS Cognate I 3 | PKG Elective II 3 |
| ISS 2xx 4 | (or 201 or 315) | Electives 6 | Electives 4 |
| MTH 124 3 | CEM 143 4 | 15 | 14 |
| 16 | 14 | | |
| YEAR TOTAL= 31 | YEAR TOTAL= 30 | YEAR TOTAL= 30 | YEAR TOTAL= 29 |
| 12/22/2009 | CUM. TOTAL= 61 | CUM. TOTAL= 91 | CUM. TOTAL= 120 |

RIT – B.S. in Packaging Science Curriculum. Source:
<http://www.ist.rit.edu/~pscidrupal/?q=node/18>. Accessed: March 1, 2011

Packaging science, B.S. degree, typical course sequence

| | | Qtr. | Cr. |
|--------------------|---|-------------|------------|
| | | Hrs. | |
| | New Student Seminar I 0607-200 | 1 | |
| | Principles of Packaging 0607-201 | 3 | |
| | Engineering Design Graphics 0607-301 | 4 | |
| | Packaging Materials II 0607-312 | 4 | |
| | College Algebra and Trigonometry 1016-204§ | 4 | |
| | Elementary Calculus I, II 1016-214, 215‡ | 6 | |
| | College Chemistry 1011-208 | 4 | |
| First Year | Introduction to Chemistry of Materials, Lab 1011-273, 277 | 4 | |
| | Introduction to Organic Chemistry, Lab 1011-213, 207 | 4 | |
| | Principles of Microeconomics 0511-211 | 4 | |
| | Liberal Arts* | 8 | |
| | Wellness Education† | 0 | |
| | First-Year Enrichment 1105-051, 052 | 2 | |
| | Packaging Materials I 0607-311 | 4 | |
| | Rigid Containers 0607-321 | 4 | |
| | Flexible Containers 0607-322 | 4 | |
| | Computer Applications 0607-341 | 4 | |
| Second Year | Technical Communication 0607-420 | 3 | |
| | Principles of Printing 2082-371 | 4 | |
| | Principles of Marketing 0105-363 | 4 | |
| | Introduction to Polymer Technology 1029-301 | 2 | |
| | Microbiology in Health Disease 1004-210 or 1016-320 | 4 | |
| | Principles of Macroeconomics 0511-402 | 4 | |
| | Liberal Arts* | 8 | |
| | Electives | 2 | |
| | Wellness Education† | 0 | |
| | | | |
| Third Year | Career Seminar 0607-401 | 1 | |
| | Packaging Production Systems 0607-431 | 4 | |
| | Packaging for Distribution 0607-432 | 4 | |

| | | |
|--------------------|-------------------------------------|------------|
| | Packaging for Marketing 0607-433 | 4 |
| | Shock and Vibration 0607-485 | 4 |
| | College Physics I, II 1017-211, 212 | 8 |
| | Math/Science Electives§ | 8 |
| | Effective Speaking 0535-501 | 4 |
| | Liberal Arts* | 8 |
| | Electives | 4 |
| | | |
| | Packaging Regulations 0607-462 | 4 |
| | Professional (Packaging) Electives | 12 |
| Fourth Year | Liberal Arts* | 12 |
| | Electives | 16 |
| | | |
| | Total Quarter Credit Hours | 188 |

*Please see Liberal Arts General Education Requirements for more information.

†Please see Wellness Education Requirement for more information.

§Students are required to choose two out of the following three courses to fulfill the math/science electives requirement: College Physics III (1017-213), Data Analysis II (1016-320), or Microbiology (1004-210).

Appendix L – Related Occupation Employment Statistics for the U.S.

| Occupation | | Employment (in thousands) | | Employment change, 2010-2020 | |
|--|---------|------------------------------|-----------|------------------------------------|---------|
| Title | Code | 2010 | 2020 | Number (in thousands) | Percent |
| Total, All Occupations | 00-0000 | 143,068.2 | 163,537.1 | 20,468.9 | 14.3 |
| Industrial Engineers | 17-2112 | 203.9 | 217.0 | 13.1 | 6.4 |
| Engineers, All Other | 17-2199 | 156.5 | 166.8 | 10.3 | 6.6 |
| Environmental Scientists and Specialists, Including Health | 19-2041 | 89.4 | 106.1 | 16.7 | 18.7 |
| Environmental Engineers | 17-2081 | 51.4 | 62.7 | 11.3 | 21.9 |
| Commercial and Industrial Designers | 27-1021 | 40.8 | 45.1 | 4.3 | 10.5 |
| Physical Scientists, All Other | 19-2099 | 30.3 | 32.9 | 2.6 | 8.5 |
| Materials Engineers | 17-2131 | 22.3 | 24.2 | 1.9 | 8.7 |
| Food Scientists and Technologists | 19-1012 | 13.9 | 15.0 | 1.1 | 8.0 |
| Materials Scientists | 19-2032 | 8.7 | 9.5 | 0.9 | 10.2 |

Source: Bureau of Labor Statistics. Occupational Outlook Handbook, 2010-2011.
Available at: <http://data.bls.gov/oep/noeted>. Downloaded March 24, 2012

| Industry | NAICS Code | U.S. Employment 2002 | Virginia Employment 2002 | Source |
|--|---------------|----------------------------|--------------------------------|---|
| Food Manufacturing | 311 | 1,506,932 | 33,280 | http://www.census.gov/econ/census02/data/industry/E311.HTM |
| Converted paper product manufacturing | 3222 | 332,817 | 6,983 | http://www.census.gov/econ/census02/data/industry/E3222.HTM |
| Warehousing and Storage | 493 | 565,533 | 5,282 | http://www.census.gov/econ/census02/data/industry/E493.HTM |

| | | | | |
|---|--------|---------|-------|---|
| | | | | s02/data/industry/E493.HTM |
| Unsupported plastics film, sheet, and bag manufacturing | 32611 | 110,292 | 4,090 | http://www.census.gov/epcd/ec97/industry/E32611.HTM |
| Pharmaceutical and Medicine Manufacturing | 3254 | 203,337 | 2,677 | http://www.census.gov/epcd/ec97/industry/E3254.HTM |
| Graphic design services | 54143 | 62,036 | 1,217 | http://www.census.gov/econ/census02/data/industry/E54143.HTM |
| Wood Container and Pallet Manufacturing | 321920 | 51,003 | 938 | http://www.census.gov/econ/census02/data/industry/E321920.HTM |
| Plastics bottle manufacturing | 326160 | 33,933 | 804 | http://www.census.gov/epcd/ec97/industry/E326160.HTM |
| Packaging machinery manufacturing | 333993 | 24,753 | 585 | http://www.census.gov/econ/census02/data/industry/E333993.HTM |
| Packaging and labeling services | 56191 | 53,277 | 375 | http://www.census.gov/econ/census02/data/industry/E56191.HTM |

Source: U.S. Census 2002