Summary of 2014/15 Senate Actions and Resolutions

Twenty-Nine Senate Actions were passed by the Faculty Senate during the 2014/15 academic year. Their dispositions and Senate Resolutions are listed below.

**Senate Actions**

<table>
<thead>
<tr>
<th>Number</th>
<th>Date</th>
<th>Disposition</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA 1-14/15</td>
<td>Approved</td>
<td>New Program: Diversity Studies Minor</td>
<td></td>
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<tr>
<td>SA 2-14/15</td>
<td>Approved</td>
<td>New Program: Graduate Certificate in Cybersecurity</td>
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<tr>
<td>SA 3-14/15</td>
<td>Approved</td>
<td>New Program: Graduate Certificate in Finance</td>
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<tr>
<td>SA 4-14/15</td>
<td>Approved</td>
<td>New Program: Graduate Certificate in Administrative Studies</td>
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<tr>
<td>SA 5-14/15</td>
<td>Approved</td>
<td>Approval of AGR 320 to Revised General Education Program</td>
<td></td>
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<tr>
<td>SA 6-14/15</td>
<td>Approved</td>
<td>Program Change: General Education Program Change</td>
<td></td>
</tr>
<tr>
<td>SA 7-14/15</td>
<td>Approved</td>
<td>Program Deletion: M.A. in Theatre</td>
<td></td>
</tr>
<tr>
<td>SA 8-14/15</td>
<td>Approved</td>
<td>New Program: MS in Cybersecurity</td>
<td></td>
</tr>
<tr>
<td>SA 9-14/15</td>
<td>Approved</td>
<td>New Program: Master of Arts in Teaching and Learning</td>
<td></td>
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<tr>
<td>SA 10-14/15</td>
<td>Approved</td>
<td>New Program: Graduate Certificate in Teaching and Learning</td>
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<tr>
<td>SA 11-14/15</td>
<td>Approved</td>
<td>New Program: Graduate Certificate in Teacher Leadership</td>
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<tr>
<td>SA 12-14/15</td>
<td>Approved</td>
<td>New Program: Specialist in Education, Teacher Leadership</td>
<td></td>
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<tr>
<td>SA 13-14/15</td>
<td>Approved</td>
<td>New Interdisciplinary Program: Bachelor of General Studies</td>
<td></td>
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<tr>
<td>SA 14-14/15</td>
<td>Approved</td>
<td>New Program: Bachelor of Science in Theatre</td>
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<tr>
<td>SA 15-14/15</td>
<td>Approved</td>
<td>New Program: Bachelor of Science in Dance</td>
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<tr>
<td>SA 16-14/15</td>
<td>Approved</td>
<td>New Program: Graduate Certificate in Public Health &amp; Homeland Security</td>
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<tr>
<td>SA 17-14/15</td>
<td>Approved</td>
<td>New Program: Graduate Certificate in Public Health Administration</td>
<td></td>
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<tr>
<td>SA 18-14/15</td>
<td>Approved</td>
<td>New Program: Graduate Certificate in Public Health Core</td>
<td></td>
</tr>
<tr>
<td>SA 19-14/15</td>
<td>Disapproved</td>
<td>Senate Action on Equated Hours and Compensation</td>
<td></td>
</tr>
<tr>
<td>SA 20-14/15</td>
<td>Approved</td>
<td>New Program: Graduate Certificate in Literacy</td>
<td></td>
</tr>
</tbody>
</table>
SA 21-14/15  Approved  Program Deletion: Library Science Minor
SA 22-14/15  Approved  New Program: Master of Science in Child Life Studies
SA 23-14/15  Approved  New Program: Graduate Certificate in Elementary Mathematics Specialist
SA 24-14/15  Approved  New Program: Graduate Certificate in Conservation Education
SA 25-14/15  Approved  New Program: Graduate Certificate in Community Corrections
SA 26-14/15  Approved  New Program: History Bachelor of Science
SA 27-14/15  Approved  New Program: Sustainability Minor
SA 28-14/15  Approved  New Program: Forensic Child Psychology Undergraduate Certificate
SA 29-14/15  Approved  Senate Action on Adopting Electronic Curricular Format

**Senate Resolutions**

SR 1-14/15  Resolution in Honor of Dr. Ryan Giedd 2013-2014 Faculty Senate Chair
SR 2-14/15  Resolution in Honor of Ms. Kathryn Gibson Secretary of the Faculty, 2013-2014
SR 3-14/15  Resolution in Honor of Dr. Jeremy Chesman 2013-14 Faculty Senate Parliamentarian
SR 4-14/15  Resolution Conferring Honorary Doctorate upon Mr. Thomas Strong
SR 5-14/15  Resolution Conferring Honorary Doctorate upon Mrs. Elise Crain
SR 6-14/15  Senate Resolution on Faculty Leave and Support
SR 7-14/15  Senate Resolution on Springfield’s Civil Rights Ordinance
SR 8-14/15  Senate Resolution on Tenurable Faculty
Missouri State University
Curricular Proposal – New Program
(MAJOR, OPTION, MINOR, CERTIFICATE, OR CERTIFICATION)

This form is to be used for internal Missouri State approval of any proposal for a new program involving two or more courses, including any new graduate program, new undergraduate major (whether comprehensive or non-comprehensive), new option within an existing program (whether graduate or undergraduate), new minor, new certificate, or new certification program.

New graduate programs, new undergraduate majors, and certificate programs involving more than 18 credit hours require approval by the CSHE as well as approval through the Missouri State curricular process. CSHE applications for such programs are processed through the Office of Institutional Research. All proposals for new programs requiring CSHE approval should progress through the Missouri State curricular process accompanied by a draft of the required CSHE documentation.

Department: CLSE

Date: December 10, 2014

Attach on separate sheets (1) statement of rationale and objectives, (2) estimated costs for first five years, and (3) complete catalog description (including new courses and course changes pending approval). [Note: For new programs requiring CSHE approval, CSHE forms NP, PS, and PG will satisfy #1 and CSHE forms FP will satisfy #2.]

PROPOSED PROGRAM: Graduate Certificate: Director of Special Education

Major: Comprehensive Major: Option: Minor: Certificate: X Certification: X Academic Rules: Other:

Degree Applicability: Added certification for K-12 School Administrators

General Education Courses Required: N/A

General Education Courses Recommended: N/A

Total Hours:

Requirements (Including Admission) and Limitations for Specific Degree: Admission Requirements: Masters or Education Specialist in Educational Administration: A written "Statement of Purpose" containing long-term goals of leadership; Reference from immediate supervisor regarding performance; A copy of appropriate teacher certificate or eligibility for certification by a state agency as a K-12 building- or district-level administrator; 3.5 GPA in graduate degree program; Interview with EAD advisor prior to admission.

Courses Required in Department: EAD 884 Internship; Special Ed Director-Part I; EAD 885 Internship; Special Ed Director-Part II; EAD 782 Administration of Special Programs; SPE 782 Advanced Diagnosis & Remediation of Students; SPE 782 Adv. Dia./Remediation Lab

Total Hours: 14

Courses Required in Other Departments: N/A

Total Hours:

Prerequisites for Required Courses: SPE 715 Foundations in Special Education or equivalent

Recommended Electives in Department: N/A

Total Hours:

Recommended Electives in Other Departments: N/A

Total Hours:

Limitations on Electives:

DEPARTMENT: Route according to ART VI, SEC 38(1-4) of Bylaws of the Faculty Senate. Attach New Program Resource Information form (FS-302a/06) and forward three typed, originally signed forms to one of the following (please mark all that apply). If the program needs to go through more than one committee/council, forward one additional form for each additional council committee marked.

X Professional Education Committee (All proposals affecting BS and MS in Education and Educational Specialist degrees)

X Committee on General Education and Intercollegiate Programs (All general education and multi-campus programs)

College Council (Send all new undergraduate programs through College Council as first step before forwarding either to PEC, CSEP, or directly to Faculty Senate)
1. **COLLEGE COUNCIL (ART VI, SEC 3B)**
   - **APPROVED**: After dean review/comment, forward two signed copies of final action to the Secretary of the Faculty for disposition, or forward appropriate number of copies to next committee level for approval.
   - **DISAPPROVED**: Return one signed copy of final action to the appropriate Department Head.

   Comment(s)________________________

   Signature_________________________ Date________________________

2. **DEAN OF THE COLLEGE (ART VI, SEC 5)**
   - **REVIEWED**: Return to College Council Chair within ten days of receipt for disposition.

   Comment(s)________________________

   Signature_________________________ Date________________________

3. **PROFESSIONAL EDUCATION COMMITTEE (ART III, SEC 9)**
   - **APPROVED**: Forward two signed copies of final action to the Secretary of the Faculty for disposition, or forward three signed copies to next committee level for approval.
   - **DISAPPROVED**: Return one signed copy of final action to the appropriate Department Head.

   Comment(s)________________________

   Signature_________________________ Date________________________

4. **COMMITTEE ON GENERAL EDUCATION AND INTERCOLLEGIATE PROGRAMS (ART IV, SEC 2)**
   - **APPROVED**: Forward two signed copies of final action to the Secretary of the Faculty for disposition, or forward three signed copies to next committee level for approval.
   - **DISAPPROVED**: Return one signed copy of final action to the appropriate Department Head.

   Comment(s)________________________

   Signature_________________________ Date________________________

5. **GRADUATE COUNCIL (ART V, SEC 3, OR ART VI, SEC 3B)**
   - **APPROVED**: Forward two signed copies of final action to the Secretary of the Faculty for disposition.
   - **DISAPPROVED**: Return one signed copy of final action to the appropriate Department Head.

   Comment(s)________________________

   Signature_________________________ Date________________________

6. **FACULTY SENATE (ART VI, SEC 9)**
   - **APPROVED**
   - **DISAPPROVED**

   Comment(s)________________________

   Signature_________________________ Date________________________

7. **PROVOST (ART I, SEC 6; ART VI, SEC 9)**
   - **RECOMMENDED TO PRESIDENT**
   - **NOT RECOMMENDED TO PRESIDENT**

   Comment(s)________________________

   Signature_________________________ Date________________________

8. **PRESIDENT**
   - **APPROVED**
   - **DISAPPROVED**

   Comment(s)________________________

   Signature_________________________ Date________________________
NEW PROGRAM RESOURCE INFORMATION

Program Title and Degree: Certificate: Special Education Director

Department: Counselling, Leadership and Special Education

Attach on separate sheets (1) statement of rationale and objectives, (2) estimated costs for first five years, and (3) complete catalog description (including new courses and course changes pending approval).

[Note: For new programs requiring CBHE approval, CBHE forms NP, PS, and PG will satisfy #1 and CBHE form FP will satisfy #2.]

1. Is another program being deleted or altered? ____ Yes   X No

2. If this program affects other departments or colleges, has a memo showing how it will affect them been attached to the proposal? ____ Yes   X No

3. What justification is being provided to support this proposal? (Current research, accreditation, certification or licensing requirements, other.) certification endorsement

4. If your response to #3 refers to existing or potential student demand, please indicate the activities undertaken to estimate or verify the potential or existing demand for this new program. DESE requirement for endorsement as a Special Education Director

5. What are the present/future projected enrollments for this program?
   1st year 8     3rd year 10

   In five years, how many students must be: 8-10
   a) declared minors to justify this new minors continuation
   b) declared majors to justify this new majors continuation  X

6. Which of the following would be needed to implement the proposed program? (Check all that apply.) Individuals responsible for specific areas outside of your college must be consulted.

   Additional library holdings? ____ Yes   X No
   Additional technology or other supplies? ____ Yes   X No
   Additional or remodeled facilities? ____ Yes   X No
   Additional travel funds? ____ Yes   X No
   Additional faculty? ____ Yes   X No
   Additional support staff? ____ Yes   X No
   Other additional expenses? (travel expense to site)  X Yes   ____ No

7. Have the individuals responsible for allocation of these resources been contacted to ensure the availability of these resources by the time the program is implemented?

   X Yes   ____ No   ____ Yes, but cannot ensure availability
8. Referring to question 6, if additional faculty are not required, please provide a statement as to how faculty will be made available to teach proposed new courses, if any, or to manage increased enrollments in existing courses which are to be included in the proposed new program.

Internship hours will be added to the pool of internship for that semester and divided to create a load for existing staff. However, an administrator with experience as Director of Special Education may be required as per course one semester per year if no current EAD or SPE faculty member has these credentials.

Dr. Janice Duncan, GLS Director - qualified

9. If the responses to question 1 and any parts of question 6 other than additional faculty are “no,” please provide a statement as to how the department/school (or center or college) will manage the enrollment figures provided in question 5.

Course load assignment

The signature of the individuals listed below ensures that the items above have been addressed and the resources needed will be made available when the program is implemented.
NEW PROGRAM RESOURCE INFORMATION

PROGRAM: EDUCATIONAL ADMINISTRATION

DEGREE:
GRADUATE CERTIFICATE IN EDUCATIONAL ADMINISTRATION: SPECIAL EDUCATION DIRECTOR

STATEMENT OF RATIONALE AND OBJECTIVES
The Department of Counseling, Leadership, and Special Education, Educational Administration, currently offers coursework leading to a Department of Elementary and Secondary Education (DESE) certificate for building level principals at the elementary and secondary level. This coursework requires 36 semester hours to complete. Students then take the SLLA Assessment and are recommended for certification by EAD department as a principal. DESE requires that the Master's Degree be in the field of Leadership at the elementary or secondary level to be certified in the state of Missouri.

Candidates for certification as Special Education Director from Southwest Missouri are limited to universities from Central, Northern, or Eastern regions of Missouri that are able to certify based upon additional coursework beyond a Masters Degree in Educational Administration (ELE or SEC Principal). The nature of the proposed program not only meets a statewide need, but meets Missouri State University's public affairs mission in serving the PK-12 school districts.

The request for this Graduate Certificate and DESE endorsement is to reinstate and update the Special Education Director (K-12) certification program of study that DESE has on file for the Missouri State University EAD Program. The Special Education Director (K-12) certification program was discontinued several years ago at Missouri State University, due to expected changes in statewide certification; however, the Special Education Director (K-12) certification has been continued statewide and is now reaching a point of critical need.

This Graduate Certificate and DESE K-12 endorsement is designed for students with a Masters Degree, or higher, in Educational Administration, who are also seeking certification as a Special Education Director. The EAD Program is receiving an average of 6-8 requests per year for endorsement of Special Education Director and currently requests that this program be reinstated to meet the demand for endorsement, as well as serving the needs of the K-12 districts in the State of Missouri. The Graduate Certificate will be an enhancement to the MSEd/EdS in Educational Administration and serve as a recruitment tool for graduate students in this field of study.

All courses, except EAD 884*Internship: Special Education Director, are currently offered as required coursework in either the Master of Science in Education: EAD or Master of Science in Special Education: SEACT programs. Therefore, these students will enhance and increase the enrollment of existing courses at no additional cost to the programs involved. Expenses will be minimal, due to only the addition of one 2-hour course requiring supervision.

ESTIMATED COSTS FOR FIRST YEARS
Year One  Travel to cohort site
Year Two  Travel to cohort site
Year Three  Travel to cohort site
Year Four  Travel to cohort site
Year Five  Travel to cohort site
Graduate Certificate in Educational Administration Special Education Director

Program description

A 14-credit hour Missouri State University Graduate Certificate Educational Administration: Special Education Director is available to post-Masters individuals or as an added component of the Masters degree in Educational Administration (Elementary or Secondary Principal emphasis). The certificate is also offered to students who have completed an Education Specialist in Education Administration (Elementary, secondary, or Superintendent emphasis). The Graduate certificate provides students with Department of Elementary and Secondary Education certification as Special Education Director (K-12) while acquiring advanced knowledge and skills in the fields of educational administration and special education. Coursework is designed to reflect State and National standards with demonstrated mastery of competencies through research-based projects.

Admission criteria

To be considered for the program, a student must apply and be admitted to the Graduate College. A student must also have a Masters of Education Specialist Degree in Educational Administration. Candidates must submit a written “Statement of Purpose” containing long-term goals of leadership; a professional reference from immediate supervisor regarding performance; and a copy of appropriate teacher certificate of eligibility for certification by a state agency as a K-12 building- or district-level administrator; documentation of 35 GPA in graduate degree program. Candidates will also be required to complete an individual interview with their advisor prior to admission.

Required courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAD 787</td>
<td>Administration of Special Programs</td>
<td>3 hrs</td>
</tr>
<tr>
<td>SPE 782</td>
<td>Advanced Diagnosis &amp; Remediation of Students*</td>
<td>3 hrs</td>
</tr>
<tr>
<td>SPE 792</td>
<td>Advanced Diagnosis &amp; Remediation of Students – Lab</td>
<td>2 hrs</td>
</tr>
<tr>
<td>SPE 671</td>
<td>Clinical Practicum in Special Education</td>
<td>1 hr</td>
</tr>
<tr>
<td>SPE 780</td>
<td>Contemporary Issues in Special Education *</td>
<td>3 hrs</td>
</tr>
<tr>
<td>EAD 884</td>
<td>Internship: Special Education Director – Part I</td>
<td>1 hr</td>
</tr>
<tr>
<td>EAD 885</td>
<td>Internship: Special Education Director – Part II</td>
<td>1 hr</td>
</tr>
</tbody>
</table>

*offered via internet

GPA requirements

Attain a grade point average of at least 3.00 on all graduate course work at Missouri State University.
### MISSOURI STATE UNIVERSITY

#### Program of Study for Special Education Director (K-12)

<table>
<thead>
<tr>
<th>Certification Requirements</th>
<th>College Course Number and Title</th>
<th>Sem. Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. A course in Psychology and Education of the Exceptional Child (choose 1)</td>
<td>SPE 310, 340, 715</td>
<td>3</td>
</tr>
<tr>
<td>E. Completion of a master's degree in educational leadership</td>
<td>MSED-EAD</td>
<td></td>
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<tr>
<td><strong>F. Curriculum for Educational Leaders</strong></td>
<td></td>
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<tr>
<td>1. Specific Courses: <em>These must be separate graduate courses of at least two (2) semester hours.</em></td>
<td></td>
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<tr>
<td>a. Foundations of Educational Administration - including components of career and special education</td>
<td>EAD 751</td>
<td>3</td>
</tr>
<tr>
<td>b. Special education administration</td>
<td>EAD 767</td>
<td>3</td>
</tr>
<tr>
<td>c. Differentiating instruction in the general education curriculum (choose 1)</td>
<td>EAD 745, ELE 710</td>
<td>3</td>
</tr>
<tr>
<td>d. School Supervision</td>
<td>EAD 786</td>
<td>3</td>
</tr>
<tr>
<td>2. Directed field experiences in Special Education Administration of at least two (2) semester hours</td>
<td>EAD 884 (1 hr) and 885 (1 hr)</td>
<td>2</td>
</tr>
<tr>
<td>3. Knowledge and/or competency in each of the following areas:</td>
<td></td>
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<tr>
<td>a. Instructional management systems;</td>
<td>EAD 780</td>
<td>3</td>
</tr>
<tr>
<td>b. School law including components of regular/career/special education;</td>
<td>EAD 785</td>
<td>3</td>
</tr>
<tr>
<td>c. Teaching-learning processes; (choose 1)</td>
<td>ELE 610, SEC 704 (601), EAD 746</td>
<td>3</td>
</tr>
<tr>
<td>d. Public relations;</td>
<td>EAD 784</td>
<td>3</td>
</tr>
<tr>
<td>e. Educational measurements; (choose 1)</td>
<td>SPE 782, 792, 671</td>
<td>3</td>
</tr>
<tr>
<td>f. Evaluation of teachers and human resource management</td>
<td>EAD 781</td>
<td>3</td>
</tr>
<tr>
<td>g. School business and facilities management</td>
<td>EAD 782</td>
<td>3</td>
</tr>
<tr>
<td>h. Philosophy of regular/career/special education;</td>
<td>SPE 780</td>
<td>3</td>
</tr>
<tr>
<td>i. Administration and coordination of special programs and service;</td>
<td>EAD 787</td>
<td>3</td>
</tr>
<tr>
<td>j. Administration and coordination of school activities programs; (choose 1) and</td>
<td>EAD 752/753</td>
<td>3</td>
</tr>
<tr>
<td>k. Instruction in communication skills (reading, writing, spelling, listening, speaking)</td>
<td>EAD 784</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: DESE will not evaluate transcripts for administrative certificates.
Missouri State University  
CURRICULAR PROPOSAL  
NEW COURSE (or new REGULAR SECTION of an existing variable content course)  

Department: Physics, Astronomy, and Materials Science  
Date: January 22, 2015  

Check one:  
X New COURSE  
New REGULAR (i.e. permanent) SECTION of an existing variable content course. If a new regular section of an existing variable topics course, to what existing course is it to be attached?  

Course Code: AST  
Course Number: 112  
Course Title: Life in the Universe  

PROPOSED CATALOG DESCRIPTION  

General Education Course: (Breadth of Knowledge—Natural World—Life Sciences). 3(3-0).  

An exploration of how life came to be on the planet Earth, prospects for detecting it on other worlds and what that detection, or non-detection, means to humanity. Topics include the origin of elements in the Universe and how they form the building blocks of life, how conditions favorable for life evolve on planets, how life evolves, biodiversity, recent discoveries of exoplanets, and possible effects on society.  

PURPOSE OF COURSE  

With thousands of planets discovered around other stars, the potential of detecting alien life (intelligent or not), and the consequences of those detections or non-detections, is something this generation will have to address. The big question, “Are we alone in the Universe?” will be answered within our students' lifetime, and most likely within the next few decades. This course will inform and educate our students about this timely topic to better prepare them for the amazing discoveries ahead. This course allows students to partially fulfill the Breadth of Knowledge—Natural World requirements in the General Education Program. Also see the attached pages.  

RELATIONSHIP TO OTHER DEPARTMENTS  

The undergraduate course catalog lists an intercession course titled Astrobiology (BMS455) which has not been offered in many years. This course is similar, but more in depth and aims more towards the astronomical impacts on evolution, aliens, and the human experience.  

Students are now required to take a course under the Life Sciences division of the Breadth of Knowledge—Natural World component of General Education. AST 112 Life in the Universe will be an additional offering in this component with material that is interdisciplinary, exciting, yonic, and which addresses some of the oldest questions posed by human beings.  

DEPARTMENT: Route according to ART VI, SEC 3B(1-4) of Bylaws of the Faculty. Attach New Course Resource Information form (FS 00a/05) and forward three typed, originally signed forms to one of the following (please check all that apply and send to first council/committee marked). If the course needs to go through more than one council/committee forward one additional form for each additional council/committee marked.  

X College Council  
(All new course proposals numbered 100-599 must go through College Council first. After approval, College Council will forward appropriate number of copies to the next committee/council or directly to the Faculty Senate if no further committee approval is needed.)  

Professional Education Committee  
(Considers all new courses affecting BS and MS in Education and Educational Specialist degrees)  

X Committee on General Education and Intercollegiate Programs  
(Considers all general education and multi-college new course proposals)  

Graduate Council  
(Considers all 600-, 700-, and 800-level new courses)  

If the course needs to go through more than one council/committee, forward one additional form for each additional council/committee marked.  

Signature:  
Department Head  
Date: 1-27-15  

(Routing on Reverse Side)  
FS New Course: 6/10/2014
COLLEGE COUNCIL (ART VI, SEC 3D)

APPROVED

After dean review/comment, forward two signed copies of final action to the Secretary of the Faculty for disposition, or forward appropriate number of copies to next committee level for approval.

DISAPPROVED

Return one signed copy of final action to the appropriate Department Head.

Dean of College

September 2015 FS Agenda Attachments
NEW COURSE RESOURCE INFORMATION

Department: Physics, Astronomy, and Materials Science
Date: January 20, 2015

Number and Title: AST 112 Life in the Universe

Anticipated Average Enrollment: 100
Maximum Enrollment Limit: 130

Faculty Load Assignment: 3 Equated Hours

Is another course being deleted? No If so, give course number and title.

What will this course require in the way of:

Additional library holdings? None.

Additional computer resources? None. Access to current computer labs is sufficient.

Additional or remodeled facilities? None.

Additional equipment or supplies? None, this is not a lab course.

Additional travel funds? None.

Additional faculty—general vs specialized? None.

Other additional expenses? None.

If additional faculty are not required, how will faculty be made available to teach this course?

The Physics, Astronomy, and Materials Science Department is adjusting its astronomy course offerings in response to the revised General Education Program. Condensing the current offerings allows for the inclusion of this new course.

List names of current faculty qualified to teach this course:

Becky Baker, Bob Patterson (taught a shorter version as a special course), Peter Plavchan (taught a version at UCLA), and Mike Reed.

What is the anticipated source of students for this course? (If from within the department, will students be taking this course in addition to or in place of other courses? If from outside the department, which courses in other departments would most likely be affected?)

This is a General Education course. The source of students is the same as for current introductory astronomy courses, namely, the entire student body.

Other comments:
AST 112 Life in the Universe - Sample Syllabus

Purpose: This is a general education life science course covering the evolution of life in the Universe and prospects and impacts of extraterrestrial life. This course meets the Life Science General Goal: Students will understand basic concepts of living things, the nature of scientific knowledge, and relevance of biological knowledge to human affairs. The Specific Learning Outcomes are: 1) Understand living systems by describing their nature, organization and evolution. 2) Understand and use the processes by which scientific knowledge of living things is generated. 3) Develop knowledge of living things through hypothesis testing and gain the ability to draw defensible conclusions regarding living things. 4) Make logical connections between key concepts in the life sciences and describe the interaction between human lives and other living things. 5) Understanding the human species as a biological organism. And 6) Understand the ways the environment impacts humanity and how human actions affect the environment. Other learning outcomes for this course are: 1) To understand how the Universe evolved to become hospitable for life; 2) To understand how Earth-based life developed, evolved, and was affected by astronomical events; 3) To understand the relationships between humans, other life, and their environments, including 6) terraforming; 7) To understand discoveries within our solar system and of exoplanets in relation to where life could exist; and 8) To examine the possible effects on society and humanity with acquired knowledge of whether or not alien life exists. The learning outcomes for this course will be evaluated using tests, focus group discussions, quizzes, homework, a questionnaire, and group projects.

Course design: The course will use the Drake Equation as a focus and will include the following sections:
1) History of the Universe with a focus on chemical production and energy which leads to the University where humans and other aliens could exist.
2) History of life on Earth as our only example of life within the Universe.
3) The biology and chemistry of life: conditions for life, including extremophiles.
4) Prospects for diversity of life.
5) Current exoplanet research in relation to where life could exist and how to find out whether there is alien life.
6) Impacts on society whether there is or isn’t alien life.

Student Success: The mission of Missouri State University is to develop educated persons. In this class, we will use the following instructional methods which support student learning and success: 1) small (focus) group discussions; 2) peer instruction; 3) clickers; and 4) group projects.

Materials: The texts for this course are Life in the Universe by Bennett and Shostak and How Life Began: Evolution’s Three Geneses by Meinesz. These are the only texts you will need for this course. However, this is a very dynamic and evolving area of science and so (some) lecture notes, useful links, and other material will be posted on the web.
<table>
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<th>Week</th>
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| 1-3  | August (M, W, F) | • Course overview, the scientific search for life in the universe.  
• Ancient astronomy, basic astronomy.  
• Formation of the solar system | 1-3      |
| 4-5  | September (M, W, F) | • Cosmology, the origins of the Universe  
• Matter, Energy & Light  
• The Habitability of Earth | 4-5      |
| 6-8  | September (M, W, F) | • Appearance of life on Earth & Evolution  
• Searching for Life in the Solar System & in particular Mars | 6-8      |
| 9-11 | October (M, W, F) | • Midterm Exam (Chapters 1-8)  
• Search for life in the solar system: Jupiter and beyond  
• The Life Cycle, Classification of Stars, Nature of Habitability and the search for habitable worlds around other stars | 9        |
| 12-14| November (M, W, F) | • The Habitable Zone and Earth’s Fate  
• Climate Change and Global Warming  
• Exoplanets | 10-11   |
| 15-16| December (M, W, F) | • Search for Intelligent Life (SETI)  
• Interstellar travel and Fermi Paradox  
• Final Exam (in class, cumulative) | 12,13   |
AST 112 Life in the Universe - Sample Outline

Chapter 1
Extraterrestrial life: life beyond Earth
Extrasolar planets: planets orbiting stars other than our sun
Habitable worlds: worlds that contain the basic necessities for life
Organic molecules for life. Must look for simple organisms
SETI: search for extraterrestrial intelligence

Chapter 2
Greks on Extraterrestrial life
Atomists: believed Earth and the heavens made from infinite number of indivisible atoms of each of the four elements
Belief in extraterrestrial life
Natural to assume that the same processes that created our world could also have created others
Aristotelians: the four elements were confined to the realm of Earth, while heavens were made of distinct element ether World must be unique, so no other worlds exist
A scientific model must make testable predictions about natural phenomena that would force us to revise or abandon the model if the predictions do not agree with observations.
Paradigm
Scientific Theory

Chapter 3
Astronomical Definitions
Star, planet, extrasolar planet, habitable planet, moon or satellite, asteroid, comet, solar system, star system, galaxy, universe or cosmos
Expanding Universe
Evidence comes from the overall chemical composition of the universe – calculations that run the expansion backwards led scientists to predict that the universe was about 4% hydrogen and 4% helium, which observations closely match.
Star Stuff
When we say that Earth and life are made from "star stuff", what we really mean is that the elements that make up the Earth and life were made from the fusion of helium and hydrogen inside stars larger than our sun.
Accretion and terrestrial planet formation
Jovian Planet Formation

Chapter 4
Geology: the study of earth, or any world with a solid surface
Rock analysis
Mineralogical analysis
Chemical analysis
Isotopic analysis
Radiometric dating
Most reliable way to determine the age of a rock, fossil, or other solid object
Radioactive decay always occurs at a specific and measurable rate that is different for every radioactive isotope.
Idea is to determine the age of a rock form the ratio of parent and daughter atoms within it, which depends only on the decay rate and the length of time over which the decay has been occurring.

Geological time scale

4 Eons
Hadean - oldest!
Archean: 2.5 to 3.85 bya
Proterozoic: 540 mya to 2.5 bya
Phanerzoic: Present to 540 mya

3 eras
Paleozoic (old life)
Mesozoic (middle life)
Cenozoic (recent life)

Eras divided into periods

Age of Earth
Oldest intact earth rocks date to about 4 bya
Radiometric dating shows that tiny mineral grains of zirconium silicate (zircons) date to 4.4 bya
Rocks on moon date to 4.4 bya
Maximum age set by dating formation of solar system as a whole via meteorites that are 4.57 bya

Key geological definitions
The Hadean Earth and the Dawn of Life
Atmosphere
Possible to inhabit earth after 100 myrs. Many modern day microbes survive in absence of oxygen.
However, lots of volcanic eruptions.
Possible Sterilizing impacts
Impact of object 10-20 km thought to have caused the extinction of dinosaurs 65 mya
Asteroid of 350-400 km would vaporize the oceans and raise global surface temperature to 2000 deg C
No way to know if anything this big happened during hadean period
Greenhouse effect makes earth habitable
Global average temperature: average temperature of the entire planet
Green house effect
Regulating Earth’s temperature
The Carbon dioxide cycle

Chapter 5
Properties of Life
Order: exhibit some sort of order in the molecules or the arrangement of the atoms
Reproduction: reproduce or are products of reproduction
Growth and development
Energy utilization
Response to the environment
Evolutionary adaptation
Species: groups of organisms that are genetically distinct from other groups
Genus: the generic category to which an organism belongs, which will be specified by the species
Mechanisms for Evolution
Fact 1: overproduction and competition for survival
Fact 2: individual variation.
Fact 3: the inescapable conclusion; unequal reproductive success
"Natural selection"
Cells
Cells: microscopic units in which the living matter inside is separated from the outside world by a barrier called a membrane
All pass on their hereditary information with DNA
Earth life is carbon based
Life on earth made of 20 different elements
Oxygen, carbon, hydrogen, and nitrogen make up 98% of mass of typical living cells
Silicon based life – 3 strikes!
Bonds formed by silicon significantly weaker than carbon bonds. i.e. more fragile, making complex molecules too fragile to form the structural components of living cells
Silicon does not normally form double bonds, which carbon does. This limits the variety of molecular structures
Carbon can be mobile in the environment in the form of gaseous carbon dioxide, but silicon dioxide is a solid
Molecular components of cells
Carbohydrates: provide energy to cells, cellular structure
Lipids: store energy for cells. Can spontaneously form membranes in water, trapping other organic molecules inside the membrane – important for early earth
Proteins: key evidence of common ancestor of life!
Some serve as structural elements, enzymes are crucial to all important biochemical reactions (including copying of DNA). Catalyst facilitates a chemical reaction or accelerates it
Built with large chains of amino acids – this is important evidence that all life on earth shares a common ancestor
Nucleic acids: DNA, RNA (carries instructions to DNA)
3 Domains of Life on Earth
Bacteria
Archaea
Eukarya
4 Metabolic Classifications
Phototrophs: get energy from plants and carbon from carbon dioxide in the environment
Plants
Chemotrophs: get energy from chemical reactions and carbon from environmental carbon dioxide
Need neither sun nor food to survive. Archaea in hot springs are an example.
Phototrophs: get energy from sun and carbon from consuming other organisms or their remains
Much rarer. Found in lakes, rivers, hot springs, and some aquatic environments with very high salt concentrations
Chemoheterotrophs: get energy from chemical reactions and carbon from consuming other organisms
Water and the Metabolism
Metabolism requires that organic chemicals be readily available for reactions, and liquid water allows organic chemicals to float within the cell
Metabolism requires a means for transporting chemicals to and within cells
Water plays role in many of the metabolic reactions within cells, i.e. necessary for the reactions that store and release energy in ATP= adenosine triphosphate
ATP is used to store and release energy – every living cell uses it!
What kinds of conditions can life survive?
Extremophiles: organisms that survive in extreme environments
Endoliths (within rocks) special interest for Mars. Live within rocks, chemotrophs
Thermophiles: organisms that survive in extremely hot water
Many from Archaea domain.
A lot of hyperthermophiles are anaerobic (live without oxygen)
Psychrophiles: cold-loving organisms
Chapter 6
Stromatolites: rocks that are characterized by a distinctive, layered structure.
Photosynthesize and those below use the waste products of the photosynthesized microbes.
Evidence that they date back as far as 3.5 bya
Microfossils
Difficult to find because old rocks are often destroyed with time, altered by geological processes
3.5-3.2 bya: fossilized cells, up to debate.
2.7-3 bya: particular molecules that almost certainly indicate biological origin
Isotopic Evidence
The Miller-Urey Experiment
Other Sources of Organic Materials
RNA World
Possibility of Migration

Chapter 7
Water’s role on Earth
Potential liquids for life
Ammonia, methane, and ethane remain liquid within reasonable temperatures
Advantages of water
Environmental requirements for habitability
Must have a source of molecules from which to build living cells
Must have a source of energy to fuel metabolism
Must have a liquid medium – most likely liquid water – for transporting the molecules of life

Chapter 8
Mars invading popular culture
Conditions on Mars
Temperature well below freezing, atmospheric pressure of 1% of Earth’s, 40% of Earth’s gravity, days are 40 minutes longer than on earth
Lack of surface liquid water
Geological History
Evidence of water on Mars
Channels almost certainly carved by running water 2-3 bya
Must have had much warmer and thicker atmosphere at one point
Martian water today
Climate
How Mars changed
Habitability
Has elements for life: energy for life (sunlight), chemical energy (underground volcanoes), just needs liquid water
Life on Mars – 3 Viking experiments
However, no measurable level of organic molecules in the Martian soil at all.
Methane detected
Comes from either comet impacts, volcanic activity, or life
Meteorites
Chapter 9
Jovian Moons
Jupiter: Io, Ganymede, Callisto
Europa
Evidence for an ocean
Life on Europa?
Source of elements to build living organisms: rock/water combo probably has all elements needed
Source of energy for growth and metabolism: unknown
If volcanism in deep water vents, then possible. However, on earth, most of energy still filters down
from life above.
Total energy available is less than available on earth
Liquid medium for transporting molecules of life?
Saturn
Titan
Atmosphere
Possibility of life
Strong evidence of liquid hydrocarbons, but since methane and ethane are colder than liquid water,
chemical reaction rates would be slower, so outlook for biology is bleak.
Synchronous rotation of the moons
Tidal Heating
Chemical energy
Need disequilibrium to initiate a chemical reaction
Reduction: process of accepting electrons
Oxidation: process of losing electrons
Electron transport chains: chains of redox reactions used for photosynthesis and other life processes
Amino Acids
Building blocks from proteins
Molecules containing an amine group, a carboxylic acid group and a side chain that varies between
different amino acids.
These molecules contain the key elements of carbon, hydrogen, oxygen, and nitrogen.
Handedness
In nature, you see both right and left handed amino acids, but most amino acids in life are left handed

Chapter 10
Habitable zone
Range of distances from a star at which a planet could potentially have surface temperatures that would
allow for abundant liquid water
3 factors:
Life outside habitable zone?
Venus
Runaway Greenhouse effect
Global warming
Increasing CO2
Evidence from tree rings and ice cores
Consequences of global warming
Chapter 11
Star's "Life Cycle"
Types of Stars
Multi-star systems
Binary star systems
Detecting planets
Directly
Indirectly
Precise measurements of stellar properties (position, brightness, or spectra) may indirectly reveal the
effects of orbiting planets
Gravitational Tugs
Astrometric Technique
Doppler Technique
Transits
Gravitational Lensing
Hot Jupiters
Most of the discovered planets are around size of Jupiter or Saturn (can't detect smaller planets as well
yet) and most either have close orbits to the star or highly elliptical orbits
Formation
Planets likely formed in outer regions of their solar systems (Jovian traits), but migrated when waves in
the nebula caused these young planets to spiral slowly toward their star.
Habitability
Unlikely these would be habitable, but maybe moons would be
Theoretical work suggests that the migration of hot Jupiters could affect inner solar system seriously, i.e.
swallow terrestrial worlds or fling less massive planets inward toward its star or outward to interstellar
space
Impact rates and Jupiter
Many trillions of comets orbit the sun (Oort Cloud) at distances beyond Pluto
If Jupiter did not exist, the comets might have remained in the part of the solar system where they could
pose a danger to Earth.
Climate stability
Plate tectonics important for climate stability due to its role in CO2 cycle
Earth's tilt is fairly static due to the gravitational tugs from Moon. If there were no moon, Earth's
rotation would be greater affected by other planets, causing large swings in tilt.

Chapter 12
Drake Equation
Equation that lays out the factors that are important in determining the number of transmitting
civilizations
Does not give us an actually number because we don't know that values of all variables
\[ N_{\text{civilizations}} = N_{\text{HP}} \times f_{\text{life}} \times f_{\text{ciw}} \times f_{\text{now}} \]
\[ N_{\text{HP}} = \text{habitable planets}, \quad f_{\text{life}} = \text{fraction of HP that have life}, \quad f_{\text{ciw}} \]
\[ = \text{fraction of life with civilization capable of interstellar communication}, \quad f_{\text{now}} \]
\[ = \text{fraction of these that have civ now capable of this} \]
Measuring Intelligence
Encephalization Quotient (EQ)
Plot of brain mass vs. body mass, where EQ=1 means typical allotment of mental ability for creatures of
their size
Dolphins = 5, chimps = 2.5, humans = 7
EQs for dolphins and whales improved drastically around 35 mya when developed eco-location
An elevated social position for dolphins and primates often allows you to have 1st choice in mates, so
clever, high-ranking individuals will tend to produce clever, high-ranking offspring.
SETI
Send frequency of 1420 MHz b/c it is the frequency at which neutral hydrogen gas produces natural
radio static
Categories of signals
Signals used for local communication on the world where intelligent beings live
Signals used for communication b/w a civilization's home world and some other site, such as a colony or
spacecraft on another world
International signal beacons, purposely designed to get the attention of other societies

Chapter 13
Messages abroad
Because spacecraft themselves should survive unsathed for millions of years in the near-vacuum of
interstellar space, we have included messages in case any extraterrestrial beings someday find them
Escape velocity
11 km/s to overcome Earth's gravity
Limitations of chemical rockets
Requires a mass ratio (mass of fully fueled rocket to empty rocket) of 39 to reach escape velocity
Spacecraft for interstellar flight
Nuclear fission, ion engine, Solar sails, Ramjets and Relativity
Fermi Paradox
The idea that neither we nor our planet is in any way special suggests that someone should have
colonized the galaxy by now.
The idea of a galactic civilization implies that we should be surrounded by evidence of this civilization –
but aside from unconvincing claims of extraterrestrial UFOs, no such evidence exists.
It should have been possible or Earth-like planets to be born at least 5 billion years before our own
planet.
Possible solutions
We are alone
Civilizations are common, but no one has colonized the galaxy
Von Neumann machines
General idea of self-replicating machines would allow us to explore much farther and wider than we
could by going to other worlds ourselves.
Also, these machines could function after journeys through space that take centuries to millennia.
This course is about Life in the Universe wrapped in the context of the Drake Equation. This equation includes factors for 1) how the Universe produced the conditions (chemistry and energy) amenable to life; 2) the conditions which we know are favorable to life (chemicals which are important for life, the developments of proteins to DNA to higher organisms), the prospects for life in other conditions (extremophiles on Earth, silicon-based life, buoyant life on non-Terrestrial planets), the generation and spread of biological materials, and recent results concerning the abundance of planets; 3) evolution of life and astronomical impacts upon evolution; 4) the propensity of life to develop civilizations which emit signals outside of their ecosystem; 5) and the survivability of such civilizations. Beyond the Drake Equation, the class will also consider the impact on current societies whether there is or isn’t alien life.

Life Science Goals of understanding basic concepts of living things addressed in #2 & 3; nature of scientific learning in #1; and relevance of biological knowledge to human affairs in #4 & 5.

This course is multidisciplinary in that it draws extensively from astronomy, physics, chemistry, biology and geology. It is timely because only recently could astronomers begin to estimate the numbers and conditions of extrasolar planets, and space exploration has revealed other likely places for life within our own solar system. Most likely, during the lifetimes of our current student population, we will (at least statistically) know whether alien life exists or not!