The Discipline of Scientific Writing and Preparation of Competitive Grant Applications

Spring 2017

Course Leader: Dr. Devendra K. Agrawal
Course Number: CTS 713

Course Title: The Discipline of Scientific Writing and Preparation of Competitive Grant Applications

Credit Allocation: 3 credits

Course Leader: Dr. Devendra K. Agrawal dkagr@creighton.edu

Course Description: This course focuses on the scientific writing, key components of any grant proposal, and preparation of the traditional research project grant (National Institutes of Health R01) which supports a focused research program. Content will also be relevant to all research grant applications to funding agencies. Emphasis will be placed on writing clear English.

Course Objectives:
1. Discuss strategies for winning an NIH grant.
2. Identify components of a strong grant application.
3. Describe the key information to be included in each section of a grant application.
4. Identify problems and concerns commonly cited by grant reviewers.
5. Critique selected sections of grant applications prepared by others.
6. Prepare a research application.

Methods of Teaching/Learning: The course will include a combination of didactic instruction, individual presentations, and group discussion.

Methods of Student Evaluation:
Preparation of a grant application 40%
Submission of written assignments by due date 20%
Participation in class discussion 40%

Course Requirements:

I. R01 Application without budget (40% of grade)

Grading Guidelines for R01 Application:

A. Specific Aims page (30%)
   - Inclusion of all components described in the *Grant Application Writer’s Handbook*
   - Conceptual overview provides a compelling flow of logic
   - Clarity of ideas
   - Clearly described hypothesis and specific aims
   - Measureable outcome variables

B. Significance section (15%)
   Includes convincing discussion of the following:
   - The scientific premise for the proposed project, including consideration of the strengths and weaknesses of published research or preliminary data crucial to the support of your application.
   - Whether the project address an important problem or a critical barrier to progress in the field.
   - If the aims of the project are achieved, how scientific knowledge, technical capability, and/or clinical practice will be improved.
   - How successful completion of the aims will change the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field.

C. Innovation section (15%)
   Includes convincing discussion of the following:
   - How the application challenges and seeks to shift current research or clinical practice paradigms by utilizing novel theoretical concepts, approaches or methodologies, instrumentation, or interventions.
   - The way/s in which the concepts, approaches or methodologies, instrumentation, or interventions are novel to one field of research or novel in a broad sense.
   - The refinement, improvement, or new application of theoretical concepts, approaches or methodologies, instrumentation, or interventions that are proposed.

D. Approach section including timetable (10%)
   Includes discussion to:
   - Describe the experimental design and methods proposed and how they will achieve robust and unbiased results.
   - Explain how relevant biological variables, such as sex, are factored into research designs and analyses for studies in vertebrate animals and humans. For example, strong justification from the scientific literature, preliminary data, or other relevant considerations, must be provided for applications proposing to study only one sex.
   - Convince the reviewer that the overall strategy, methodology, and analyses well-reasoned and appropriate to accomplish the specific aims of the project.
   - Present the potential problems, alternative strategies, and benchmarks for success.
   - Answer the question, “If the project is in the early stages of development, will the strategy establish feasibility and will particularly risky aspects be managed?”
   - Describe the timeline for each stage of the project.

E. Human Subjects section (5%) (Students who are not proposing a clinical study will be expected to complete this section for a clinical project provided by Dr. Agrawal.)
   Includes thorough discussion of each of the following:
   - risk to subjects
• adequacy of protection against risks
• potential benefits to the subjects and others
• importance of the knowledge to be gained
• data and safety monitoring for clinical trials
• human subjects involvement and characteristics
• sources of materials.
• Inclusion/exclusion criteria
• Inclusion/exclusion of women and children

F. Vertebrate Animals (5%) (Students who are not proposing an experimental animal study will be expected to complete this section for a project provided by Dr. Agrawal.)
Includes thorough discussion of each of the following:
• description of procedures
• justifications for the species- explain if alternate models could be used
• minimization of pain and distress
• euthanasia whether consistent with the AVAMA recommendations

G. Format (20%)
• The application will consist of a maximum of 1(specific Aims page) + 6 typed pages. The Human Subjects section, Vertebrate Animals and references are additional.
• The format will be that described in the Grant Application Writer’s Handbook and the SF424 Application Guide for R01. http://grants.nih.gov/grants/funding/424/index.htm
• The following example of citation format will be used appropriately
• In-text references are superscripted Arabic numerals in the order they appear in the text, eg 5.


II. Submitting/completing assignment by due dates (20%)
Assignments and due dates
1. Download onto a flash-drive the application for an NIH R01. http://grants.nih.gov/grants/guide/pa-files/PA-13-302.html Also, download onto flash-drive the WORD versions of the continuation page, the Biographical Sketch Format Page, and the Biographical Sketch Sample and bring to class Jan 21:
   http://www.esc.edu/esconline/across_esc/writerscomplex.nsf/0/f87fd7182f0ff21c852569c2005a47b7
2. Complete the exercises for help on developing a research question before class on Jan 26.
3. Research project goal and research question on flash drive due at the beginning of class January 31
4. Revised research question and hypothesis and literature highlights on flash drive due at the beginning of class Feb 14.
5. Significance and Innovation on flash drive due Feb 23
6. Specific aims page on flash drive due Mar 7
7. Approach on flash drive due Mar 21
8. R01 application by email to Dr. Agrawal and printed out due April 11
III. Participation in class discussion (40%)
This implies attendance and on-time arrival at all class sessions and active participation in the discussion.
Attendance and participation at a minimum of 12 class sessions required for an A.
Attendance and participation at a minimum of 10 class sessions needed for a B.

Resources:
1) Website for help on developing a research question
http://www.esc.edu/esconline/across_esc/writerscomplex.nsf/0/f87fd7182f0ff21c852569c2005a47b7

CTS 713 Course (3 Credit hours)
Tuesdays and Thursdays
Spring 2017 Session

<table>
<thead>
<tr>
<th>CLASS PERIOD</th>
<th>DAY</th>
<th>DATE</th>
<th>TOPIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Th</td>
<td>1/12</td>
<td>Introduction, review of course objectives, and general outline of major sections in most of the grant applications</td>
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<tr>
<td>2</td>
<td>Tu</td>
<td>1/17</td>
<td>Types of NIH and other extramural grant opportunities</td>
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<tr>
<td>3</td>
<td>Th</td>
<td>1/19</td>
<td>Formulating a research question and a testable hypothesis, and preparing a Specific Aims page</td>
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<td>4</td>
<td>Tu</td>
<td>1/24</td>
<td>Preparing the background/significance and innovation sections</td>
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<td>5</td>
<td>Th</td>
<td>1/26</td>
<td>Grant writing: tips and tools</td>
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<td>6</td>
<td>Tu</td>
<td>1/31</td>
<td>Figure preparation for presentation and grants: tips and tools</td>
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<td>7</td>
<td>Th</td>
<td>2/2</td>
<td>Presentation and critique of student figures</td>
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<td>8</td>
<td>Tu</td>
<td>2/7</td>
<td>Presentation and critique of student research questions, hypotheses, and Specific Aims</td>
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<td>9</td>
<td>Th</td>
<td>2/9</td>
<td>Presentation and critique of student research questions, hypotheses, and Specific Aims</td>
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<td>10</td>
<td>Tu</td>
<td>2/14</td>
<td>Preparing the Approach section: preliminary data and research strategy; rationale; pitfalls and alternatives</td>
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<tr>
<td>11</td>
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<td>2/16</td>
<td>Strategies for winning grants</td>
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<td>12</td>
<td>Tu</td>
<td>2/21</td>
<td>Presentation and critique of background/significance section</td>
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<td>3/2</td>
<td>Presentation and critique of specific aims page</td>
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<td>Tu</td>
<td>3/7</td>
<td>Presentation and critique of specific aims page</td>
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<td>17</td>
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<td>3/9</td>
<td>Spring Break</td>
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<td>18</td>
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<td>3/14</td>
<td>Spring Break</td>
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<tr>
<td>19</td>
<td>Th</td>
<td>3/16</td>
<td>Presentation and critique of innovation section</td>
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<td>20</td>
<td>Tu</td>
<td>3/21</td>
<td>Preparing a budget and NIH biosketch</td>
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<td>Th</td>
<td>3/23</td>
<td>Preparing other ancillary files, e.g. description of animal use, project summary, project narrative, references</td>
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<td>22</td>
<td>Tu</td>
<td>3/28</td>
<td>Working with mentors, and preparing a research training plan (F30/F31/F32)</td>
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<td>23</td>
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<td>Presentation and critique of Approach Section</td>
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<td>4/6</td>
<td>Presentation and critique of Approach Section</td>
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<tr>
<td>26</td>
<td>Tu</td>
<td>4/11</td>
<td>Presentation and critique of Approach Section</td>
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<tr>
<td>27</td>
<td>Th</td>
<td>4/13</td>
<td>Overview of the grant review process and scoring</td>
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<tr>
<td>28</td>
<td>Tu</td>
<td>4/18</td>
<td>Planning a research trajectory and strategizing for extramural funding</td>
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<td>29</td>
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<td>4/20</td>
<td>Final Grants Due. Addressing reviewer comments; writing an Introduction to Application (Resubmission)</td>
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<td>30</td>
<td>Tu</td>
<td>4/25</td>
<td>Writing grant reviews: Strengths and Weaknesses</td>
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<td>31</td>
<td>Th</td>
<td>4/27</td>
<td>Mock reviews</td>
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<tr>
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<td>5/4</td>
<td>Mock reviews</td>
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<td>34</td>
<td>Tu</td>
<td>5/9</td>
<td>Roundtable discussion</td>
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