ACADEMIC PROGRAM PROPOSAL FORM

(Revised May 2014)

DIRECTIONS: *Use this form when proposing a new major or primary field of study, new emphasis, or new degree program.*

DATE SUBMITTED: November 20, 2015

INSTITUTION: University of Nevada, Reno

Date of AAC Approval:
December 2, 2015

REQUEST TYPE:

- ☒ New Degree
- ☐ New Major or Primary Field of Study
- ☐ New Emphasis

Date of Board Approval:

DEGREE (i.e. Bachelor of Science): BS in BME (named degree)

MAJOR (i.e. Animal Science): Biomedical Engineering

EMPHASIS (i.e. Equine Studies):

CREDITS TO DEGREE: 129

PROPOSED SEMESTER OF IMPLEMENTATION: Fall 2016

Action requested:
This proposal is to create a new undergraduate degree program in Biomedical Engineering.

A. Brief description and purpose of proposed program
To establish a BME undergraduate program that well addresses needs identified in the university, college, and/or department strategic plans.

B. Statement of degree or program objectives
Biomedical engineering (BME) is the application of engineering principles and design concepts to medicine and biology. Our BME program provides students with a firm foundation in electrical engineering fundamentals while teaching them how these principles are applied in biomedical engineering.

C. Plan for assessment of degree or program objectives
The program will be assessed based on the standards of ABET BME program assessment.

D. Plan for assessment of student learning outcomes and the use of this data for program improvement

Relying on ABET BME program assessment guidelines, students learning outcomes a - m will be assessed as described below. The data from these assessment items will be used to make adjustments in the program to better meet the following student learning objectives:

a. Students will be able to apply knowledge of mathematics, science, and engineering.
b. Students will be able to design and conduct experiments, as well as to analyze and interpret data.
c. Students will be able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d. Students will be able to function on multidisciplinary teams.
e. Students will be able to identify, formulate, and solve engineering problems.
f. Students will be able to understand professional and ethical responsibility.
g. Students will be able to communicate effectively.
h. Students will be able to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
i. Students will be able to recognize the need for, and will be able to engage in life-long learning.
j. Students will be able to have knowledge of contemporary issues.
k. Students will be able to use the techniques, skills, and modern engineering tools necessary for engineering practice.
l. Students will be able to understand biology and physiology.
m. Students will be able to address problems associated with the interaction between living and non-living materials and systems.

E. Contribution and relationship of program objectives to

i. NSHE Master Plan

The new program will meet the plan objective that will help Nevada and Nevadans for the diversified knowledge economy.

ii. Institutional mission

According to Goal 3 in the University Institutional Strategic Plan (2009-2015), the University plans to prepare Nevada and Nevadans for the diversified knowledge economy. As listed in demonstrated needs (e), (f), and (g) above, the proposed BME program clearly addresses the needs as it is an economic engine and is highly prized for economic diversification, particularly in any region where heavy manufacturing is not feasible, e.g., Nevada. The University Institutional Strategic Plan can be found at http://www.unr.edu/president/strategic-and-master-planning/strategic-plan.

iii. Campus strategic plan and/or academic master plan

Please see the description in ii.

iv. Department and college plan

According to Strategic Goals and Objectives in the Engineering College strategic plan, the College will (1) develop education, research and outreach programs that address important regional, national and international needs and position the College as a state, regional and national leader of engineering and computer science education; (2) become a catalyst for the

state's economic diversification; (3) develop a state-of-the-art accredited education program that serves the needs of the state and the nation, that equips students to become regional, national and world leaders in their respective fields, and (4) increase the number of high-quality undergraduate and graduate students. As listed in demonstrated needs of the BME program, the new BME program clearly addresses these needs. The College Strategic Plan can be found at http://www.unr.edu/Documents/engineering/college/strategicPlanSummary_march2011.pdf.

According to the goals in the EBME department strategic plan, BME is one of three broad focus areas for the department. The proposed BME program will provide our students with an education in biomedical engineering that includes the program objectives of depth, breadth and professionalism and will further promote student recruitment for the department. In addition, the proposed BME program will enhance the development of critical masses in research areas such as biosensors/actuators, biomedical imaging, and bioelectronics currently conducted in the department. The department strategic plan can be found at http://www.unr.edu/ebme/about.

v. Other programs in the institution

BS, Electrical Engineering

vi. Other related programs in the System

None

F. Evaluation of need for the program

i. Intrinsic academic value of program within the discipline

The new program will be a necessary addition to our Engineering discipline and make the discipline more comprehensive, competitive and attractive.

ii. Evidence of existing or projected local, state, regional, national and/or international need for program

The evidence for offering the BME undergraduate degree in the department and the college is as follows:

(a) Employment of biomedical engineers is projected to grow much faster than the average for all occupations in the next ten years and BME was ranked number 1 by CNN Money in their Best Jobs in America 2013 listing;

(b) An undergraduate BME degree is expected to draw additional students to UNR as evidenced during many high school tours of the EBME department that were conducted under a funded NSHE research grant;

(c) BME involves the most women among engineering disciplines and is consistently among the most highly paid;

(d) ABET now accredits undergraduate BME programs within colleges of engineering;

(e) NIH includes the National Institute of Biomedical Imaging and Bioengineering; because of the budget differential between the NIH and NSF, BME is often an economic engine for colleges of engineering;

(f) BME and related biotechnology are highly prized for economic diversification, particularly in any region where heavy manufacturing is not feasible, as in Nevada;

(g) BME programs in many universities are being established and expanded following the rising demands in the healthcare industries and the increasing research interests in such highly interdisciplinary program;

(h) An undergraduate BME program is an essential support for the current graduate BME program and will serve as a student recruitment base for enhancing the graduate program; undergraduate TA activities (the manning of laboratories in particular) will be synergistic to both undergraduate and graduate BME programs.

iii. If this or a similar program already exists within the System, what is the justification for this addition

BME is a huge field that encompasses endless combinations of engineering and biomedical disciplines. The proposed BME program is intended to emphasize topics related to electrical engineering such as biomedical instrumentation, sensors, signal processing and image processing. This is a completely different objective from the biomedical engineering specialization in chemical engineering. There is no duplication with other majors/minors.

iv. Evidence of employment opportunities for graduates (state and national)

According to data from the Department of Labor, employment of biomedical engineers is projected to grow much faster than the average for all occupations in the next ten years. Please see (http://www.bls.gov/ooh/architecture-and-engineering/biomedical-engineers.htm#tab-6).

Employment of biomedical engineers is projected to grow 27 percent from 2012 to 2022, much faster than the average for all occupations. Biomedical engineers will likely see more demand for their services because of the breadth of activities they engage in, made possible by the diverse nature of their training.

As the aging baby-boom generation lives longer and stays active, they are expected to increase the demand for biomedical devices and procedures, such as hip and knee replacements. In addition, as the public has become aware of medical advances, increasing numbers of people are seeking biomedical solutions to health problems for themselves from their physicians.

Biomedical engineers work with medical scientists, other medical researchers, and manufacturers to address a wide range of injuries and physical disabilities. Their ability to work in different activities with other professionals is enlarging the range of applications for biomedical engineering products and services, particularly in healthcare.

Additional evidence is that Biomedical Engineer is the number 1 fastest growing job in America listed by CNN Money (2013). Demand for biomedical engineers is projected to grow a whopping 62% between 2010 and 2020. Please see http://money.cnn.com/gallery/pf/jobs/2013/11/13/fastest-growing-jobs/index.html.

v. Student clientele to be served (Explain how the student clientele is identified)

Students seeking a career in BME or admission to medical school.

The new BME program will primarily affect the BME emphasis in the BS EE degree. It is not expected to affect the BME track in the Chemical Engineering program because it addresses different audiences. Biomedical engineering (BME) is the application of engineering principles and design concepts to medicine and biology. Our BME program provides students with a firm foundation in electrical engineering fundamentals while teaching them how these principles are applied in biomedical engineering (Please see the prepared Catalog Copy for BS BME program), while the BME track in the Chemical Engineering program focuses on using chemistry, physics, biology and mathematics to solve problems related to the production and manufacture of goods and materials.

G. Detailed curriculum proposal

i. Representative course of study by year (options, courses to be used with/without modification; new courses to be developed)

No new courses are required for the proposed BME program. The program curriculum is designed based on the current BME Emphasis Curriculum and medical school admission requirements. Basic courses from other UNR departments (Chemistry, Biology, Biochemistry, and Microbiology) will be required or on the elective list of the new program and will see an increase in enrollment.

ii. Program entrance requirements

BME Program Entrance Requirements: In addition to the university requirements for admission to the baccalaureate programs (Please see UNR Admission to Bachelor's Degree Programs, http://catalog.unr.edu/content.php?catoid=6&navoid=1296), the Engineering programs specifically recommend the following entrance requirements for its degree candidates: four units of mathematics (including trigonometry or pre-calculus) and three units of science, including physics and chemistry, and a half year of computer programming. Advanced placement classes in calculus and science are particularly valuable.

iii. Program completion requirements (credit hours, grade point average; subject matter distribution, preprogram requirements)

129 credit hours and a 2.0 GPA are required for completion; additional details are included in attached catalog description.

iv. Accreditation consideration (organization (if any) which accredits program, requirements for accreditation, plan for attaining accreditation - include costs and time frame)

ABET will accredit the new BME program.

ABET program criteria apply to engineering programs that include “bioengineering,” “biomedical,” or similar modifiers in their titles. The structure of the curriculum must provide both breadth and depth across the range of engineering and science topics consistent with the program educational objectives and student outcomes. The curriculum must prepare graduates with experience in:

• Applying principles of engineering, biology, human physiology, chemistry, calculus-based physics,mathematics (through differential equations) and statistics;
• Solving bio/biomedical engineering problems, including those associated with the interaction between living and non-living systems;
• Analyzing, modeling, designing, and realizing bio/biomedical engineering devices, systems, components, or processes; and
• Making measurements on and interpreting data from living systems.

Once the new BME program is established, it will be accredited every six years. Based on the accreditation process, the first accreditation will happen in the sixth year of the new program. After starting the new BME program, we will strictly follow the ABET program criteria above mentioned to attain accreditation for the program.

v. Evidence of approval by appropriate committees of the institution

The new program was approved by the University Courses and Curricula Committee on 11/6/2015.

The new program was approved by the College of Engineering Curriculum Committee on 10/7/2015.

H. Readiness to begin program

i. Faculty strengths (specializations, teaching, research, and creative accomplishments

Currently the program has four core faculty members; their specializations, teaching and research are summarized as follows:

Dr. Bahram Parvin, Professor. Dr. Parvin's research interest is at the intersection of large scale image-based phenotypic data, development of machine learning/imaging methods for predicting biological processes and new biomarkers, and screening imaging probes for in situ imaging. Having been a member of several programmed projects and investigator-initiated NIH programs, he has developed an appreciation for the complexities associated with biological processes and the unique values of a multidisciplinary research program. Other research interests include identifying molecular drivers of heterogeneity and the impact of heterogeneity on biological processes.

Dr. Chang Hang, Assistant Professor. Dr. Hang's research interest is in bio-imaging computation and applications.

Dr. Xiaoshan Zhu, Associate Professor. Dr. Zhu's research interest is in (1) New chemical/physical properties of nanomaterials and their applications in bio-detection; (2) Multi-modality bioimaging using engineered composite nanomaterials for disease diagnosis and therapy; (3) Integrated sensor systems using bioMEMS technologies; (4) Development, evaluation, and application of biosensors for environmental analysis, food safety, medicine, etc.

Dr. Yantao Shen, Associate Professor. Dr. Shen's research interest is in the areas of Bioinstrumentation & Automation, Biomechatronics/Robotics, Sensors and Actuators, and Tactile/Haptic Interfaces.

ii. Contribution of new program to department's existing programs (both graduate and undergraduate) and contribution to existing programs throughout the college or university

The proposed BME program will provide our students with an education in biomedical engineering that includes the program objectives of depth, breadth and professionalism and will further promote student recruitments for the department. In addition, the proposed BME program will enhance the development of critical masses in research areas such as biosensors/actuators, biomedical imaging, and bioelectronics currently conducted in the department.

iii. Completed prior planning for the development of the program (recent hires, plans for future hires, securing of space, curricular changes, and reallocation of faculty lines)

The department has recently hired an Assistant Professor in biomedical engineering and already has three other biomedical engineering professors. No additional hires are required for the program. The department will need an additional teaching wet lab. Prior to the availability of any new building facilities, partial space/rooms in three wet labs directed by BME faculty Drs. Parvin, Zhu and Shen can be shared for the interim wet lab for the BME undergraduate students. All other space needs can be met by the current space allocation of the EBME department.

iv. Recommendations from prior program review and/or accreditation review teams
While we do not have recommendations from prior program reviews, contacts with other BME programs indicate the need for a teaching wet lab as listed in (iii)

v. Organizational arrangements that must be made within the institution to accommodate the program
None

I. Resource Analysis

i. Proposed source of funds (enrollment-generated state funds, reallocation of existing funds, grants, other state funds)
Because the new program was designed to exploit courses and facilities that already exist at UNR, the impact of the new program is expected to be minimal. New equipment for the wet teaching lab will be required and will be funded using differential fees supplemented with college and departmental funds. Other sources of funds will be NIH, NSF, DoED, NSHE, and many private foundations such as Whitaker Foundation, HHMI's science education program, W.M. Keck Foundation.

ii. Each new program approved must be reviewed for adequate full-time equivalent (FTE) to support the program in the fifth year. Indicate if enrollments represent 1) students formally admitted to the program, 2) declared majors in the program, or 3) course enrollments in the program.

a. (1) Full-time equivalent (FTE) enrollment in the Fall semester of the first, third, and fifth year.

1st Fall semester 10

3rd Fall semester 40

5th Fall semester 70

(2) Explain the methodology/assumptions used in determining projected FTE figures.
Assumptions are made based on the number of students who inquire the information about BME program.

b. (1) Unduplicated headcount in the Fall semester of the first, third, and fifth year.

1st Fall semester 10

3rd Fall semester 40

5th Fall semester 70

(2) Explain the methodology/assumptions used in determining projected headcount figures.
The head count estimates are based on the number of students who have inquired about the BME program.

iii. Budget Projections – Complete and attach the Five-Year Budget Projection Table.
See attached table.

J. Facilities and equipment required

i. Existing facilities: type of space required, number of assignable square feet, space utilization assumptions, special requirements, modifications, effect on present programs
The new program was designed to exploit courses and facilities that already exist at UNR.

ii. Additional facilities required: number of assignable square feet, description of space required, special requirements, time sequence assumed for securing required space
A teaching wet lab will be required. The lab is required for the BME senior project and can also be used in lab exercises for existing BME courses (BME 401, BME 424). The lab will support our undergraduate and graduate biomedical engineering courses in areas such as bioinstrumentation, biosensors, bio-imaging, and bio-signal processing.

iii. Existing and additional equipment required
Additional equipment for the teaching wet lab will be required including installing fume hoods that provide the needed ventilation to limit exposure to hazardous or toxic fumes, vapors or dusts during experiments. Other equipment includes lab based air condition/filtering system installation; workbenches set-up; water tanks, compressed air, gas and vacuum supplies; lab electricity plugs (AC and high current 30A), and waste containers.

K. Student services required – Plans to provide student services, including advisement, to accommodate the program, including its implications for services to the rest of the student body
Currently, there are four core BME faculty who will be able to provide student services.

L. Consultant Reports – If a consultant was hired to assist in the development of the program, please complete subsections A through C. A copy of the consultant's final report must be on record at the requesting institution.

i. Names, qualifications and affiliations of consultant(s) used
Not applicable

ii. Consultant's summary comments and recommendations
Not applicable

iii. Summary of proposer's response to consultants
Not applicable

M. Articulation Agreements

i. Articulation agreements were successfully completed with the following NSHE institutions. (Attach copies of agreements)
Articulation agreements with TMCC, CSN, WNC and GBC will be developed for transfer to UNR to major in the undergraduate BME degree program.

ii. Articulation agreements have not yet been established with the following NSHE institutions. (Indicate status)
Articulation agreements with TMCC, CSN, WNC and GBC will be developed for transfer to UNR to major in the undergraduate BME degree program.

iii. Articulation agreements are not applicable for the following institutions. (Indicate reasons)
Not applicable

N. Summary Statement

Biomedical Engineering is the application of engineering to problems in biology and medicine. Biomedical engineers address these problems by designing measuring and diagnostic systems and analyzing biological and physiological data. The BS BME curriculum provides students with an interdisciplinary education that includes a strong background in math, science and electrical engineering. With a few additional courses, graduates of the program have the option to apply for admission to medical school. The Department of Electrical and Biomedical Engineering also cooperates with local industry to offer a number of summer internships for qualified undergraduate students.

The new BME program well addresses needs identified in university, college, and department strategic plans and will be a necessary addition to our Engineering discipline and make the discipline more comprehensive, competitive and attractive.

Because the new BME program was designed to exploit courses and facilities that already exist at UNR, the impact of the new program is expected to be minimal and the new program can be implemented with minimal resources.

Biomedical Engineering, B.S. in BME

DESCRIPTION:

Biomedical Engineering is the application of engineering to problems in biology and medicine. Biomedical engineers address these problems by designing measuring and diagnostic systems and analyzing biological and physiological data. The BS BME curriculum provides students with an interdisciplinary education that includes a strong background in math, science and electrical engineering. With a few additional courses, graduates of the program have the option to apply for admission to medical school. The Department of Electrical and Biomedical Engineering also cooperates with local industry to offer a number of summer internships for qualified undergraduate students. The curriculum for the Bachelor of Science in biomedical engineering degree is listed below.

NOTE: The professional FE examination, administered by the state board of engineering registration, must be taken by all biomedical engineering students before graduation during the senior year of study.

CONTACT INFORMATION:

Incoming students, freshmen and sophomores should contact the Engineering Advising Center, in SFB 100, at CoENAdvising@unr.edu for questions about coursework. Juniors and seniors should contact their faculty advisor directly.
Department: office SEM 332, ph. (775) 784-6927
Website (http://www.unr.edu/ebme)

ADMISSION REQUIREMENTS:

Admission requirements and procedures are available at http://www.unr.edu/admissions#requirements. Only students who are eligible to enroll in MATH 181 (as demonstrated through placement tests) may enter specific major programs within the College of Engineering. Others may enter the undeclared engineering program. Undeclared engineering students must be admissible to a specific major program within four regular semesters (fall and spring).

GRADUATION REQUIREMENTS:

A. Total Units	129 units
B. Cumulative GPA	2.0
C. University GPA	2.0
D. Major GPA	2.0
E. Residency Requirement	30 upper-division units at UNR, 15 units of Major Requirements
F. Upper-Division Requirement	40 upper-division units
G. Minimum Units from 4-Year Institutions	64-65 units

COURSE REQUIREMENTS:

Students in this major must meet all Silver Core Objectives (**CO1** through **CO14**). Courses satisfying Core Objectives are designated (e.g., **CO9**) in General Catalog curricula and course descriptions.

I. University General Education Requirements (30 units)

A. Silver Core Writing and Prerequisite (6 units): **– CO1, CO3**
   1. ENG 101 - Composition I (3 units)
   2. ENG 102 - Composition II (3 units)

   NOTE: Students who place in ENG 102 are not required to complete ENG 101 or ENG 100J.

B. Silver Core Mathematics and Prerequisite (4 units) **- CO2**
   MATH 181 - Calculus I (4 units) *

   NOTE: Engineering students are expected to place in MATH 181 or higher. Students who do not place in MATH 181 may be required to take additional credits before declaring their major.

C. Silver Core Natural Sciences (8 units) **- CO4**
   1. CHEM 201 - General Chemistry for Scientists and Engineers I (4 units)
      OR
      CHEM 121A - General Chemistry I (3 units) * AND
      CHEM 121L - General Chemistry Laboratory I (1 unit) *
   2. PHYS 180 - Physics for Scientists and Engineers I (3 units) * AND
      PHYS 180L - Physics for Scientists and Engineers Laboratory I (1 unit) *

D. Silver Core Social Sciences (3 units) **- CO6**
   ECON 102 - Principles of Microeconomics (3 units)

E. Silver Core Fine Arts (3 units) **- CO7**
   Students should choose an appropriate course that simultaneously fulfills both the Silver Core Fine Arts and **CO10** (Diversity & Equity) requirements. Refer to the Core Curriculum chapter in this catalog.

F. Silver Core Humanities (6 units):
   1. CH 201 – Ancient & Medieval World (3 units) OR **- CO5**
      CH 202 – The Modern World (3 units) **- CO5**
   2. CH 203 – The American Experience & Constitution (3 units) **- CO5, CO8**

II. Additional Silver Core Requirements (0 units)

Students must take courses that satisfy the following Core Objectives. Some or all of these requirements may be satisfied by courses in the major requirements. Refer to the Core Curriculum chapter in this catalog.

A. Science, Technology & Society Course **– CO9**
   ENGR 301 - Engineering Communications and Societal Integration (units counted in major requirements)

B. Diversity & Equity Course **– CO10**
Students should choose an appropriate course that simultaneously fulfills both the Silver Core Fine Arts and **CO10** requirements. Refer to the Core Curriculum chapter in this catalog. (units counted in General Education requirements)

C. Global Context Course **– CO11**
ENGR 100 - Introduction to Engineering Design (units counted in major requirements)

D. Ethics Course **– CO12**
EE 491 - Engineering Design/Analysis (units counted in major requirements)

E. Capstone Integration & Synthesis Course **– CO13**
ENGR 301 - Engineering Communications and Societal Integration (units counted in major requirements)

F. Application Course **– CO14**
EE 491 - Engineering Design/Analysis (units counted in major requirements)

III. Major Requirements (99 units)

A. Additional Mathematics and Sciences (38 units)
1. MATH 182 - Calculus II (4 units) *
2. MATH 283 - Calculus III (4 units) *
3. MATH 285 - Differential Equations (3 units) *
4. MATH 330- Linear Algebra (3 units)
5. MATH 352 Probability and Statistics (3 units) **OR**
6. STAT 352- Probability and Statistics (3 units)
7. PHYS 181 - Physics for Scientists and Engineers II (3 units) *
8. CHEM 122A/L General Chemistry II (4 units)
9. BIOL 190 - Introduction to Cell and Molecular Biology (3 units) *
10. BIOL 191 - Introduction to Organismal Biology I (3 units) *
11. BIOL 223A/L Human Anatomy and Physiology I (4 units)
12. BIOL 224 A/L Human Anatomy and Physiology II (4 units)

B. Engineering Science and Design Courses (52 units)
1. CS 135 - Computer Science I (3 units) *
2. CPE 201 - Digital Design (3 units)
3. CPE 301 - Embedded Systems Design (3 units)
4. ENGR 100 - Introduction to Engineering Design (3 units) **– CO11**
5. EE 220L - Circuits I Laboratory (1 unit)
6. EE 220 - Circuits I (3 units) *
7. EE 221 - Circuits II (3 units)
8. EE 291 - Computer Methods for Electrical Engineers (3 units)
9. ENGR 301 - Engineering Communications and Societal Integration (3 units) **– CO9, CO13**
10. EE 320L - Electronics I Laboratory (1 unit)
11. EE 320 - Electronics I (3 units)
12. EE 330 - Engineering Electromagnetics (3 units)

13. EE 362 - Signals and Systems (3 units)
14. EE 370L - Control Systems I Laboratory (1 unit)
15. EE 370 - Control Systems (3 units)
16. BME 401 - Introduction to Biomedical Engineering (3 units)
17. BME 426 Biomedical Instrumentation (3 units)
18. EE 490 - Electrical Projects Laboratory (3 units)
19. EE 491 - Engineering Design/Analysis (4 Units) **– CO12, CO14**
20. ENGR 490 - Fundamentals of Engineering Exam (0 units)

C. Technical Electives (9 units)

Nine technical electives units to be chosen from:

1. CEE 241/ME 241 – Statics (3 units)
2. EE 420 - Electronics II (3 units)
3. EE 421 - Digital Electronics (3 units)
4. EE 426 - Microprocessor Applications (3 units)
5. EE 480 - Digital Signal Processing (3 units)
6. EE 492G - Seminar (1 to 4 units)
7. CHEM 341 - Organic Chemistry for Scientists and Professionals I (3 units)**
8. CHEM 342 - Organic Chemistry for Scientists and Professionals II (3 units)**
9. CHEM 345 - Organic Chemistry Laboratory (2 units)**
10. BIOL 192 - Principles of Biological Investigation (2 units)**
11. BIOL 251 - General Microbiology (4 units)**
12. BIOL 300 - Principles of Genetics (3 units)**
13. BIOL 315 - Cell Biology (3 units)**
14. BIOL 405 - Molecular Biology (3 units) (prerequisite BIOL 300 or BCH 400)**
15. MICR 453 - Immunology (3 units)**
16. BCH 400 - Introductory Biochemistry (4 units)**
17. EE 296, EE 396, EE 496 (up to 3 units)

IV. Minor Requirements (0 units)

V. Electives (0 units)

VI. Total Units (129 units)

For Pre-Med Students:

One more Fall semester is suggested for additional course work in genetics, immunology and biochemistry (15 units from the suggested Pre-Med electives**)

RECOMMENDED SCHEDULE:

A. First Year

Fall Semester (17 units)

CHEM 121A/121L General Chemistry (4 units)* or CHEM 201 General Chemistry for Scientists and Engineers I (4 units) – **CO4**

ENGR 100 Introduction to Engineering Design (3 units) – **CO11**

ENG 101 Composition I (3 units) – **CO1**

MATH 181 Calculus I (4 units) * - **CO2**

CS 135 Computer Science I (3 units) *

Spring Semester (17 units)

MATH 182 Calculus II (4 units)*

PHYS 180 Physics for Scientists and Engineers I (3 units)*

PHYS 180L Physics for Scientists and Engineers I (1 units)*

BIOL 190 Introduction to Cell and Molecular Biology (3 units) *

CPE 201 Introduction to Computer Engineering (3 units)

ENG 102 Composition II (3 units) - **CO3**

B. Second Year

Fall Semester (17 units)

CH201 American and Medieval Culture (3 units) –**CO5** OR

CH202 The Modern World (3 units) - **CO5**

PHYS 181 Physics for Scientists and Engineers II (3 units)*

MATH 283 Calculus III (4 units) *

CHEM 122A/L General Chemistry II (4 units)

MATH 330 Linear Algebra (3 units)

Spring Semester (16 units)

CH 203 American Experience and Constitutional Changes (3 units) – **CO5, CO8**

EE 220 Circuits I (3 units) *

EE 220L Circuit I Lab (1 unit)

EE 291 Computer Methods for EE (3 units)

MATH 285 Differential Equations (3 units) *

BIOL 191 Introduction to Organismal Biology I (3 units) *

C. Third Year

Fall Semester (17 units)

ENGR 301 Engineering Communication (3 units) – **CO9, CO13**

EE 221 Circuit II (3 units)

EE 320/320L Electronics I (4 units)

EE 362 Signals and Systems (3 units)

BIOL 223 Human Anatomy and Physiology I (4 units)

Spring Semester (17 units)

CPE 301 Microprocessor System Design (3 units)

EE 370 Control Systems I (3 units)

EE 370L Control System Lab (1 unit)

EE 330 Engineering Electromagnetics (3 units)

BIOL 224 Human Anatomy and Physiology II (4 units)

ECON 102 Principles of Economics (3 units) – **CO6**

D. Fourth Year

Fall Semester (15 units)

Core Fine Arts & Diversity course (3 units) – **CO7, CO10**

EE 490 Electrical Projects Laboratory (3 units)

ENGR 490 Fundamentals of Engineering Exam (0 unit)

BME 401 Introduction to Biomedical Engineering (3 units)

MATH 352 Probability & Statistics (3 units)

Technical Elective: (3 units, to be selected by students from the technical elective list)

Spring Semester (13 units)

EE 491 Engineering Design/Analysis (4 units) – **CO12, CO14**

BME 426 Biomedical Instrumentation (3 units)

Technical Electives: (6 units, to be selected by students from the technical elective list)

New Academic Program Proposal
Five-Year Program Cost Estimate
(Revised December 2015)

Institution: UNR **Program:** Biomedical Engineering **Semester of Implementation:** Fall 2016

DIRECTIONS: Complete the Student FTE and following cost estimates for the first, third, and fifth for the proposed new program in Section A. Any "new" costs in year one must be noted by source in Section B.

STUDENT FTE: **Year 1:** 10 **Year 3:** 40 **Year 5:** 70

Section A.

	Year 1/Start-up				Year 3		Year 5	
	Existing[1]	New[2]	Total	FTE	Total	FTE	Total	FTE
PERSONNEL								
Faculty (*salaries/benefits*)[3]	77,823	0	77,823	0.6	82,562	0.6	87,590	0.6
Graduate Assistants	21,000	0	21,000	0.5	21,000	0.5	42,000	1.0
Support Staff	0	0	0	0.0	0	0.0	0	0.0
Personnel Total	$98,823	$0	$98,823	1.1	$103,562	1.1	$129,590	1.6
OTHER EXPENSES								
Library Materials (*printed*)	0	0	0		0		0	
Library Materials (*electronic*)	0	0	0		0		0	
Supplies/Operating Expenses	20,000	0	20,000		20,000		20,000	
Equipment	70,000	0	70,000		70,000		70,000	
Other Expenses	0	0	0		0		0	
Other Expenses Total	$90,000	$0	$90,000		$90,000		$90,000	
TOTAL	$188,823	$0	$188,823		$193,562		$219,590	

Section B.

	Amount	%
EXPLANATION OF "NEW" SOURCES[2]		
Tuition/Registration Fees	0	
Federal Grants/Contracts	0	
State Grants/Contracts	0	
Private Grants/Contracts	0	
Private Gifts	0	
Other (*please specify*)	0	
TOTAL	$0	0.0%

[1]Resources allocated from existing programs to the proposed program in Year 1 should be noted in the "Existing" column.

[2]Any "New" resource utilized to fund a new program must include the source to be provided in the "Explanation of New Sources" section. Total "New" sources for the first year must equal the total under "Explanation of New Sources."

[3]Budget estimates for faculty salaries and benefits must include estimated merit and COLA increases in Year 3 and Year 5.

Explanation:
Year 1: Salary for the four existing faculty members is calculated as follows: ($105,082 (average annual salary) + $33,889 (average annual fringe)) x .35 (average teaching effort in role statement) x .5 (teaching effort devoted to BME courses) x .8 (fraction BS-BME students in BME courses) x 4 (number of BME faculty). The one TA is new for the BME401 class laboratory and the assistantship plus 15% benefits is budgeted $21,000. Other new expenses are for the wet teaching lab including supplies $20,000 and equipment $70,000. TA, supplies and equipment needs will be funded using differential fees supplemented with college and departmental funds.
Year 3: The total salary for the four existing faculty members is increased by estimated 3% annual merit/promotion/COLA. The one TA is new for the BME401 class laboratory and the assistantship plus 15% benefits is budgeted $21,000. Other new expenses are supplies $20,000 for the lab maintenance and material supplies. TA and supplies will be funded using differential fees supplemented with college and departmental funds.
Year 5: The total salary for the four existing faculty members is increased by estimated 3% annual merit/promotion/COLA. Two TAs are new for the BME401 class laboratory due to increased enrollment; two assistantships plus 15% benefits are budgeted $42,000. Other expenses are supplies $20,000 for the lab maintenance and material supplies. TAs and supplies

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