ACKNOWLEDGMENT
The contents of this handbook were written or compiled by the staff of the T&D Engineering program. All University policies, practices and procedures are consistent with Gonzaga’s Jesuit, Catholic identity and Mission Statement.

This handbook is intended to provide general information to graduate students attending the T&D Engineering program at Gonzaga University.

Published by:
GONZAGA UNIVERSITY SCHOOL OF ENGINEERING & APPLIED SCIENCE
SPOKANE, WASHINGTON 99258-0025
509.313.5701

REVISION DATE: September 17, 2014

Disclaimer: The Dean of the School of Engineering & Applied Science reserves the right to change any of the policies and procedures included in this Student Handbook at any time.
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School of Engineering Mission

Our Mission:
The School of Engineering and Applied Science produces broadly educated and capable engineers ready to contribute innovative solutions for a better world.

School of Engineering & Applied Science Educational Objectives

Engineers educated at Gonzaga University will:
• Develop engineered solutions that are well-conceived and carefully implemented to meet public and private sector needs.
• Contribute effectively to organizations as leaders and/or team members.
• Foster personal and organizational success in a dynamic, globalized professional environment.
• Improve society by applying Jesuit, humanistic values to their professional and civic responsibilities.

These four Objectives encompass the broad areas in which we believe our graduates will contribute to society in their careers and professions.

T&D Program Vision

Students educated in Gonzaga University’s Master of Engineering in Transmission and Distribution Engineering will be able to:
• Identify, formulate and solve power engineering problems through application of fundamental and broad principles and techniques from mathematics, sciences and engineering with primary attention being focused on applications in designing, maintaining and improving the nation’s electric power grid.
• Formulate a rational approach to develop and evaluate design solutions; to apply analytical, computational and experimental methods along with sound judgment to develop effective design solutions to complex, open-ended problems in power engineering.
• Participate effectively as a member of a team in projects that may involve multidisciplinary activities within the power industry.
• Communicate effectively through verbal and written means; to make effective oral/visual technical presentations to peers and management; to prepare technical summaries and detailed written reports that describe and document engineering studies.
• Conduct their power engineering work in a professional manner, cognizant of related ethical and contemporary issues and to continually improve their capabilities through lifelong learning.
• Successfully pursue careers in the power industry and its related fields to serve the Pacific Northwest, the nation, and the international community in a wide range of careers.
• To help students reach their fullest potential by helping them fully understand and appreciate the Jesuit mission with regards to life, leadership and service to others, while emphasizing an appreciation for the importance of designing and protecting a reliable, innovative national power grid.
T&D Engineering Program Contacts

Peter McKenny
Director
509-313-5702
mckenny@gonzaga.edu

Jilliene McKinstry
Assistant Director
509-313-5701
mckinstry@gonzaga.edu

T&D Engineering Program Information

Admission:
Admission to the program will be administered by faculty and staff of the T&D Program. An undergraduate degree in engineering (or related field), two letters of recommendation from immediate managers or supervisors, and a letter of intent expressing the student’s qualifications, professional goals, and employment experience will be required to enter the program. Preferred consideration for admission will be given to applications with industry experience that have completed the T&D Certificate Program.

Admission Checklist:
- Letter of intent
- Transcripts from all relevant university coursework
- GRE test score (waived for GU alumni, applicants with a current PE license or GU alumni)
- Two letters of recommendation
- Application form submitted
- Application fee (waived for GU alumni)

Prerequisites:
B.S. Degree in Civil, Mechanical, Electrical or other related engineering field. Employment in electric utility or related industry recommended.

For potential students with an EET degree or who graduated from a non-ABET accredited program, you should take the following courses before applying for admission. Due to the level of math involved in most T&D courses, it will be difficult to be successful in the program without an appropriate math background.

MATH 259 Calculus-Analytic Geometry III - 4 credits
   Parametric and polar coordinates, vectors, partial derivatives, multiple integrals.

MATH 260 Ordinary Differential Equation - 3 credits
   Solution methods for first order equations and for second and higher order linear equations.
   Includes series methods and solution of linear systems of differential equations.

EENG 301 Electromagnetic Fields and Materials (or Waves) - 4 credits (3 credits acceptable)

** Students earning the T&D Certificate are not guaranteed admission to the Master’s degree program. For example, the Graduate Admissions Committee may determine that a student does not have the appropriate undergraduate degree or math background to be successful in all the courses needed for the
master’s program. Starting in 2014, more than 15 credits of T&D coursework will not automatically transfer to the master’s program, so it is best to complete your application around the time you earn the certificate to ensure your admission before taking more courses.

**Degree Requirements:**
The Master of Engineering in T&D Engineering is a 36-credit hour degree program. Students are required to complete at least ten 3-credit Gonzaga T&D courses (including the capstone course - TADP 556 Engineering Leadership). The final six credits may be from the T&D program, approved courses from GU’s Business or Organizational Leadership programs, or approved graduate courses from other universities. Once admitted to the T&D program students will be given six years to complete their degree. Students will choose three “core” classes (from the student’s chosen track of Transmission or Distribution); the final projects from these courses will be included in the student’s graduation portfolio.

To receive an M.E. Degree in T&D Engineering the student must have an average cumulative grade point of 3.0 or better in the T&D program. Prior to being awarded their degree each student is expected to participate in the campus visit associated with the Engineering Leadership course. (International students may choose to complete the online component in lieu of the campus visit).

Basic requirements for completion and award of the degree are 36 credits of coursework including:
- A cumulative grade point average of at least 3.0 in the program
- TADP 556 Engineering Leadership Capstone course
- A portfolio is required as the culminating project (includes strategic plan from TADP 556 and final projects from three other T&D courses.)

**Campus Visit:**
The TADP 556 Engineering Leadership capstone course has one weekend campus visit (currently offered in May). Students must attend ethics and leadership workshops at Gonzaga’s Spokane campus on the chosen Saturday. A T&D dinner is offered the Friday before where students may meet program faculty.

**Notification of Intent to Graduate:**
Degrees are granted at the end of each semester: Fall (December), Spring (May), and Summer (August). Students are expected to apply to graduate through the T&D Director. Please observe appropriate deadlines for application for graduation. Formal commencement ceremonies are held in May each year, and graduating students are invited to participate, regardless of the semester their degree is granted. Graduation details can be found at [http://www.gonzaga.edu/campus-resources/Offices-and-Services-A-Z/Registrar/Degree-Office/Graduate/default.asp](http://www.gonzaga.edu/campus-resources/Offices-and-Services-A-Z/Registrar/Degree-Office/Graduate/default.asp)

**Program Curriculum:**
To meet the needs of our non-traditional students all T&D courses are accelerated over an eight week period, instead of a traditional 15-week semester. Teaching methodology and course delivery have also focused on the needs of adult engineering professionals. On-line lectures (presentations) are released for viewing each Monday and the corresponding homework assignments are due the following Sunday. Students can therefore review lecture material and work on assignments anytime throughout the week or weekend as their individual needs dictate.

**Advisor:**
Students must choose a faculty advisor before completing 18 credits of the T&D master’s degree. An approved list of advisors is available from the program. This advisor will review the student portfolio and recommend for T&D graduate committee review.
**Portfolio:**
The ME in T&D Engineering requires a portfolio of appropriate coursework for graduation. Students may choose the final projects from three courses in their chosen track to submit, with their strategic plan from TADP 556, as their portfolio. A faculty committee will review the portfolio and recommend for graduation or further work. One paper copy of the portfolio and an electronic PDF copy must be submitted to the Director eight weeks prior to completion of all coursework. See Appendix D for detailed instructions.

**Course Descriptions:** See Appendix A

**Course Expectations:**
The T&D courses are regular, graduate level courses which would normally be offered over a 15 week period but has been condensed into 8 weeks. This means students should be prepared to spend several hours each week viewing lecture presentations and materials. Students should also be prepared for 2 hours of individual study for each hour of presentations. While instructors are here to help students with questions, this is a graduate level course and as such will require a high level of individual accountability in completing the course.

**Late Homework Grading Policy:**
Because this is a graduate level program for industry professionals, homework assignments must be turned in on time. Assignments turned in less than 48 hours past the deadline will be automatically deducted 20 percent of the possible points. (A perfect solution for a 5 point problem would earn 4 points, a solution earning 4 out of 5 points would receive 3 points). Assignments turned in between 2 and 5 days late can receive no more than 50 percent of the eligible points.

Once the solution is posted, no points may be given for the assignment. This allows instructors the opportunity to post homework solutions for the class in a timely manner to build upon earned knowledge through the course. If you foresee a problem with turning an assignment in on time due to work or family crisis, please inform instructors before the due date to make arrangements to avoid penalty.

**Zagweb:**
Students can register for classes, access student account information, pay their bills and view unofficial transcripts in Zagweb. (Web address: zagweb.gonzaga.edu).

Regarding student accounts- Students should receive a statement from student accounts to their Zagmail account. Students have two weeks from receiving that statement to pay without penalty. Payment can be made online through the Zagweb site but students have mentioned there is a substantial fee if paying by credit card. Students may pay via “echeck” though in the same area of Zagweb without the fee. Click "review billing statement/make a payment" at bottom of screen. It will take you to Cashnet and one of the payment options is echeck. To simply view a statement in Zagweb, click Student and Financial Aid link (NOT electronic billing and payment), then Student Records, then Account Summary by Term.

**To view transcripts-** enter secure area, then student & financial aid area, then student records, then academic transcripts.

**Transfer of Credits:**
Students may apply up to six semester credits from another accredited college or university toward the M.E. in T&D Engineering. Courses must be clearly graduate level as defined by the granting institution. Courses may not have been used toward any other degree. The subject matter of courses transferred, if
they meet a program requirement, can be substituted for an elective that is appropriate to the program, which is determined by evaluation of program Director. The date of each course considered needs to be within 5 years of the beginning semester at Gonzaga. No course for which a grade less than “B” has been awarded may be accepted. Classes graded on a Pass/ Fail scale will not be considered unless Pass is equivalent to “B”.

Beginning with the 2014/15 school year, the T&D program will no longer accept transfer credits for the 15 credit T&D Engineering Certificate. Due to the brevity of the certificate coursework, and the unique nature of Gonzaga’s T&D classes, it is very difficult for students to find similar, industry-based coursework from accredited universities to justify inclusion in the certificate curriculum.

The program will continue to accept transfer of six (6) semester credits for the 36 credit Master of Engineering in T&D degree. Transfer credits must be approved by the program Director and meet all university requirements (not used for another degree, time limits, etc.)

The following guidelines are recommended when attempting to transfer credits:
- The student attempting to transfer credits to Gonzaga University should submit transcripts and course syllabus to the program Director for transfer credit approval.
- The Director will review these materials or present them to the faculty regularly responsible for teaching the courses related to the requested transfer. If the materials are deemed comparable to the courses offered through the graduate program, then full or partial credit may be advised to the Dean of the School of Engineering & Applied Science.
- The credits must meet university requirements (not used for another degree, within time limits, etc.)

Note: The transfer of credit, if allowed, will be entered into the student's record when 12 credits have been completed within the master’s program.

Tuition Reimbursement:
The T&D program reimbursement policy is changing to match the Gonzaga University policy. This change is needed to comply with federal student financial aid regulations. The policy can be found at: http://www.gonzaga.edu/Campus-Resources/Offices-and-Services-A-Z/Student-Financial-Services/Student-Accounts/Refunds/DroppedCourses14.asp

Effective January 1, 2015, T&D students may receive a full tuition refund for the first week of class. Students may receive a 75% reimbursement through the second week and 50% reimbursement through the third week of class. No tuition reimbursements will be allowed after the third week of class.

Foley Library:
Gonzaga students have access to the Foley Library and its online resources. Here is the link to the library’s homepage: www.foley.gonzaga.edu. For additional information about using the library from off-campus, visit the Distance Library Services page: www.foley.gonzaga.edu/distant. If students run into problems, they may contact Theresa Kappus, Distance Services Librarian, at kappus@gonzaga.edu or call the library’s toll-free number: 800-498-5941.

IEEE Standards at Foley Library:
Students may access IEEE standards by going to the Gonzaga Foley Library website at: http://www.gonzaga.edu/Academics/Libraries/Foley+Library/default.asp One way to get there is to choose “Databases A to Z”, then scroll down to IEEE. Click it. If students are on campus they’ll go
straight to the IEEE page, if students are off campus, it will ask for their network username and password first. This is the same info used to log onto your Zagmail account. From there students can do a browse or a search. If you have any trouble, or more direction, please contact the Foley Library staff, Konny Thompson at thompson@gonzaga.edu.

**Academic integrity:**
Gonzaga University’s academic integrity policy is outlined in the student handbook at the following website. [http://www.law.gonzaga.edu/students/student_handbook.asp](http://www.law.gonzaga.edu/students/student_handbook.asp)

**Disability Support Services:**
Disabilities Support Services (DSS) provides access to Gonzaga University’s programs, services, activities, and facilities for qualified students with disabilities in compliance with the Americans with Disabilities Act, Section 504 of the Rehabilitation Act of 1973 and Washington State laws. DSS may arrange or provide appropriate academic adjustments, reasonable accommodations, auxiliary aids, assistive technology, advocacy, and other types of assistance for students with disabilities.

Students should contact DSS to inquire about the procedure for securing academic adjustments or accommodations. Students must contact DSS at least six weeks prior to the semester for which they are requesting services.

If at any time during the process of application, admission, and enrollment, individuals feel that they have been discriminated against because of a disability, they are encouraged to notify the Disability Resources, Education, & Access Management (DREAM) Director. Incidents which have occurred more than 120 days prior to making the compliant may or may not be given consideration. To obtain copies of GU’s Informal Complaint Process for Reasonable Accommodation or the Formal Grievance Procedure, please contact the DREAM Director. The Disabilities Support Services is located in Foley Library 2nd Floor, East Side. Call (509) 313-4134.
Appendix A

T&D Program - Course Descriptions:

TADP 540 - Transmission Line Design - Introduction: Structures, foundation design, conductors, survey techniques, terrain modeling, computer-aided design, NESC code requirements. Students will design sag and tension template by hand and spot a new transmission line.

TADP 541 - Electrical Distribution System Design: Distribution System concepts, line and substation design, network planning, conductor sizing, transformer specification & connections, arrestors, underground cabling, substation overview, protection/fusing. Short circuit, load flow, reactive compensation and harmonic analysis. Integration of renewable and distributed generation into the grid.

TADP 542 - Substation Design: System overview, design principles, types of substations, components, utilization, scoping a project, project plan, site, scheduling, major equipment, control houses.

TADP 543 - Electrical Grid Operations: NERC/WECC reliability standards, control area, operation, outage coordination planning, switch theory and devices, reactive load balancing, generation load balancing, per-unit system, network modeling, power flow analysis, system disturbance analysis, and seasonal ratings.

TADP 544 - Project Development and Construction Methods: Project development, project proposals to management, project initiation, scheduling, cost management, resource management, permitting authority, land rights acquisition, overview of contracts, contractor selection, and project status tracking.

TADP 545 - System Protection: General concepts, voltage and current transformers for protection, classification and functionality of relays, overcurrent protection, distribution feeder protection, high voltage line protection with distance relaying, transformer protection, generator protection, testing and commissioning. (Prerequisite: TADP 641 or Director Permission)

TADP 547 – Underground System Design: Introduction to Cable Systems, history of cables, solid dielectric history, comparison of overhead versus underground systems, type of cable systems, accessories, manufacturing, basic cable design, installation practice, application considerations.

TADP 548 - Transmission Line Design - Electrical Aspects: Rules and requirements, design criteria & voltage levels, conductor selection & ratings, clearances, REA manual, insulation, voltage flashover, EMF fields, corona, induction coordination, grounding requirements, pole grounding, guy wire grounding, grounding measurements.

TADP 553 - System Automation: Economic benefits, reliability, safety, equipment costs, communication, transmission automation, distribution automation, under frequency load shedding, radial overhead, radial loop underground, demand side management, remote connect/disconnect, SmartGrid, consumer automation, network design aspects.

TADP 556 - Engineering Leadership: The T&D student has followed a course of study that has deepened their understanding in some highly technical areas. Paradoxically, these same skills will vault them into positions where they will have to lead. What are the benchmarks and hallmarks of leadership, especially in technical leadership? Leaders at any level are agents for change and transformative. This course provides some theory, practical framework and some tools that support a deeper understanding of
leadership. Topics will include leadership roles and responsibilities, communication, systems thinking and breakthrough leadership, leadership, change and ethics. (Capstone)

TADP 640 - Transmission Line Design - Advanced: Guyed structures, lattice towers, steel poles, soil properties & foundations under compression, foundations under lateral load, foundations under uplift, advanced sag and tension, special problems in sag and tension, LiDAR technology. (Prerequisite: TADP 540)

TADP 641 - Power System Analysis: Power system modeling, short circuit calculations, load flow algorithms and methods, and harmonic analysis and filter design. Case studies on voltage regulation, VAR control, and relay setting and coordination. Basic concepts of power systems, their components and how they are inter-related. Overview to the topology and players of the North American power grid.

TADP 680 - Special Topics: T-Line - Design of Structures & Foundations The course covers in-depth design of steel poles, concrete poles, and associated foundations. The major topics include: Review of steel pole specifications, development of loading trees, design of steel poles including arms, attachment details, base plate, anchor bolts, and connections, manufacturing process, inspections of weld details, testing of steel poles, review of concrete pole specifications, design of concrete poles, comparison of steel vs. concrete poles, associated industry national standards, direct embedment and pier foundations, foundation optimization, and anchor foundations.
Appendix B
Program Outline

Course Requirements
Thirty-six (36) credits total;
• 33* in T&D courses, including at least 9 in chosen track (used toward graduation portfolio)
  *students may substitute 6 credits from pre-approved MBA and ORGL courses.
• 3 in TADP 556 Capstone

1. Required core courses provide basic tools for power industry engineering design.

Transmission Track Courses
- TADP 540 Transmission Line Design-Introduction 3 credits
- TADP 543 Electric Grid Operations 3 credits
- TADP 544 Project Development & Construction Methods 3 credits
- TADP 547 Underground System Design 3 credits
- TADP 548 Transmission Line Design-Electrical Aspects 3 credits
- TADP 640 Transmission Line Design-Advanced* 3 credits
- TADP 680 Transmission Line Design-Structures 3 credits

Distribution Track Courses
- TADP 541 Distribution System Design 3 credits
- TADP 542 Substation Design 3 credits
- TADP 545 System Protection** 3 credits
- TADP 547 Underground System Design 3 credits
- TADP 553 System Automation 3 credits
- TADP 641 Power System Analysis 3 credits

Capstone Course
- TADP 556 Engineering Leadership 3 credits

*Prerequisite TADP 540; ** Prerequisite TADP 641 or Program Director permission

2. Advisor
Students must choose a faculty advisor before completing 18 credits of the T&D master’s degree. An approved list of advisors is available from the program. This advisor will review the student portfolio and recommend for committee review. (The program must approve the advisor before work on portfolio begins).

3. A portfolio is required as the culminating project.
As a final portfolio, students may choose the final project from three courses in their chosen track and the strategic plan from TADP 556. A faculty committee will review the portfolio and recommend for graduation or further work.
Appendix C
T&D Engineering Graduate Planning Sheet

Name:

Student ID:

Advisor:

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<td>Capstone:</td>
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<td>TADP 556</td>
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T/D Track Electives:

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Appendix C

T&D Master of Engineering Portfolio Guidelines

The ME in T&D Engineering requires a portfolio of appropriate coursework for graduation. Students may choose the final projects from three courses in their chosen track to submit, with their strategic plan from TADP 556, as their portfolio. A faculty committee will review the portfolio and recommend for graduation or further work. One paper copy of the final portfolio and an electronic PDF copy must be submitted to the Director eight weeks prior to completion of all coursework.

All students planning to graduate must submit a graduate portfolio to the T&D Program at least one semester prior to graduation. This proposal, which should be completed in consultation with the major adviser, must be approved by all members of the T&D graduation committee and the Dean of the School of Engineering & Applied Science.

Committee Signature Form: The student must submit a proposal form to the T&D program when the graduation committee approves the proposal. If the committee changes the portfolio, a copy of the new portfolio should be given to the T&D Director for final approval. (A template is provided below.)

Binding: Students should provide one bound copy of the proposal after the graduation committee signs the proposal form. The copies should be bound with black tape binding (or spiral binding if tape not available) and 70 pound cover page. The body of the document should be printed on 24 pound white paper.

Portfolio Process
1. Select faculty advisor, submit signed advisor agreement to T&D Director
2. Choose 3 final projects, make instructors’ recommended changes and submit (electronically) to advisor
3. Make any additional advisor-suggested changes
4. Submit (electronically) to Program Director for review
5. Make suggested changes and submit (electronically) for final approval
6. Final approval is given when the graduation committee signature page is completed
7. Once approved, submit two bound and one electronic copies to program for registrar approval

Tips for Portfolio
Please make all suggested changes from your course faculty; double-spacing may not be appropriate for large chunks of your document… it needs to look like a professional reference you will be able to use so clear headers, page numbering, and table of contents are needed. Also here are some notes from the advisors regarding what they expect to see in the portfolios.

- Include an introduction to the document introducing the course projects used. If student wishes, this can be a more personal narrative outlining how this work has been relevant in their professional work.
- Should include a short introduction for the material of each course and indicate the importance of it.
- The document should have a chapter on Conclusions and Recommendations. This is paramount to properly organize a road map for your reviewers.
- It is important that you organize the whole material in chapters, duly numbered, and produce a Table of Contents listing the chapters, figures and tables.
- Must be in Word.
- Make sure one font is used for all pieces (you may have different fonts from the different classes… change to one universal font like Calibri, Arial, or New Times Roman).
GRADUATION PORTFOLIO

By

JOHN SMITH

A portfolio submitted in partial fulfillment of the requirements for the degree of

MASTER OF ENGINEERING
TRANSMISSION & DISTRIBUTION ENGINEERING

GONZAGA UNIVERSITY
Transmission & Distribution Engineering
School of Engineering & Applied Science

MAY 2014

© Copyright by JOHN SMITH, 2014
Portfolio only.
All Rights Reserved
COMMITTEE SIGNATURE FORM

To the Faculty of Gonzaga University:

The members of the Committee appointed to examine the portfolio of JOHN SMITH find it satisfactory and recommend that it be accepted.

______________________________
Peter J. McKenny, Ph.D., Director

______________________________
Juan Gers, Ph.D.

______________________________
Prasad Yenumula, Ph.D.

(You must secure original black ink signatures to be submitted to the T&D Director. You may not have more lines than necessary for signatures. e.g., if you have three committee members, you may have only three signature lines)

ACKNOWLEDGMENT

This section entitled “Acknowledgment” should be used if the writer wishes to acknowledge the assistance received. The entire text of the portfolio must be double-spaced (exceptions to this would be references, which may be single spaced with a double space between entries and figure captions). There is no limit to the number of pages in this section.

TABLE OF CONTENTS

Strategic Plan (include a brief, one to two paragraph description of the strategic plan, the class in which it was completed and the semester date class was taken)

The text of the Strategic Plan follows at this point.
(New Page to begin each final project with a one paragraph description of the project, class in which it was completed and semester date class was taken)