NEW DEGREE PROGRAM PROPOSAL

ASSOCIATE OF APPLIED SCIENCE (AAS) DEGREE IN MOBILE APPLICATION DEVELOPMENT

Information and Computing Studies Department
National Technical Institute for the Deaf
Rochester Institute of Technology

May 7, 2015
Version 17
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Glossary of Acronyms

(AAS) Associate of Applied Science
(BS) Bachelor of Science Degree
(COLA) College of Liberal Arts
(COS) College of Science
(DAS) NTID’s Department of Access Services
(d/hh) deaf and hard-of-hearing
(GCCIS) B. Thomas Golisano College of Computing and Information Sciences
(HLC) Hugh L. Carey
(ICS) Information and Computing Studies
(IST) Information Sciences and Technologies
(LBJ) Lyndon Baines Johnson
(NTID) The National Technical Institute for the Deaf
(NYS) New York State
(RIT) Rochester Institute of Technology
1. Program Description and Purpose

A. Program Description

1. Overview
The Mobile Application Development program is an associate degree program that prepares students for work in the software development industry with a focus on application design and development for mobile platforms. Mobile app development is a field that brings concepts in programming, web development and interface design together. Using current and emerging technologies, students will develop skills in app design, learn relevant programming languages for application development on a variety of smart-devices and learn the policies and procedures for submitting apps for distribution.

The program is designed with 77 total credits of which 49 are technical credits, 24 are liberal arts and science credits, three credits for a free elective and one for Freshman Seminar. Courses cover multiple aspects of Internet and mobile-related technologies, including programming languages and web markup, server-side technologies and tools, mobile web development, responsive design and application optimization for mobile devices. Although the degree is designed and intended to be a career-focused terminal degree, students can continue their education by applying to transfer into the Information Technology baccalaureate degree program with a concentration in platform-specific mobile app development.

2. On-the-Job Responsibilities
Graduates of this program may work independently or with a team of programmers writing and developing software programs for mobile applications for contemporary devices. This requires skills in information gathering, user-centered design, effective deployment practices on a range of devices and strong communication skills.

3. Places of Employment
The majority of the graduates of this program will find jobs in public or private software development companies. Most often, these companies will specialize in web or mobile application development.

4. Prerequisites

**ACT:** Students with an ACT composite score of 17 or higher, with minimum scores of 18 in Mathematics, 16 in English, and 19 in Reading will be considered for direct admission to the program.

**English:** Placement in a First Year Writing course such as FYW: Writing Seminar (UWRT-150). Students that place into UWRT-100, Critical Reading and Writing would also be considered.

**Mathematics:** Placement into NTID Mathematics (NMTH-250) or higher. Typically, students entering this major will have completed at least three years of high school mathematics.

**Science:** Typically, students entering this major will have completed at least two years of high school science.
B. Educational and Career Outcomes

1. Educational Outcomes as recommended by the RIT Student Learning Outcomes Assessment Office:

Program Goals & Associated Student Learning Outcomes
1. Create effective software solutions
   - Students will be able to analyze real world problems and efficiently code solutions.
2. Create effective and user-friendly mobile interfaces
   - Students will be able to design, refine and finalize a functional and user-friendly cross-platform user interface.
3. Publish applications across multiple platforms
   - Students will be able to create, secure, test and maintain mobile applications for two or more platforms
4. Utilize effective professional communication and collaboration skills.
   - Students will be able to demonstrate effective verbal and written communication skills.
   - Students will be able to work effectively as a member of a team.
5. Indicate overall satisfaction with the program and courses.
   - Graduating students will synthesize educational experience to determine level of satisfaction

2. Career Outcomes

Career Education:
The proposed program is designed to offer students a new degree option for an attractive career in mobile application development. The skills attained will prepare students for entry-level employment as application developers, web/mobile designers and/or developers, and computer programmers. It will also prepare them for opportunities to continue their education for a baccalaureate degree should they so choose. The curriculum will be responsive to technological advances and will prepare students to meet the demands in a continually evolving workplace.

Critical Thinking and Analytical Skills:
Computer programming, which requires significant analytical skill development, is central to this AAS degree. In addition, students will enhance their abilities in reading, writing, visual communication, critical thinking, problem solving, science and mathematics. Students will have multiple opportunities in a variety of contexts to gather, process, organize and present information in technical and liberal arts courses. Because of this constantly evolving computing field, this program will provide a basis for a lifetime of intellectual inquiry.

Excellence:
The field of mobile computing and more specifically mobile application development is still emerging and cutting edge. The importance of maintaining currency in mobile technologies will remain the driving force for faculty training and teaching excellence.

NTID students will be preparing for a career in a field where no NTID Associate degree program currently leads. Also, mobile app development students will take general education coursework in other colleges of RIT, thus adding to the diversity of student experiences in those classes. Students will demonstrate their abilities to
establish quality study skills as well as high standards of analytical and ethical conduct.

**Community and Personal Growth:**
Courses offer opportunities for self-discovery, personal and social responsibility, and enhancement of interpersonal skills as well as promoting career awareness. Liberal studies in global, social, artistic and ethical focus areas as well as extensive technical education promote community and personal growth. As members of the NTID and broader RIT communities, students will have opportunities to expand their intellectual, social and cultural experiences with deaf/hard-of-hearing and hearing students.

A learning support community established for students with activities both in and out-of-class will allow for increased peer support and additional faculty and student interaction, which is expected to enhance retention and increase graduation rates.

**Lifelong Learning:**
Because of the constantly evolving nature of mobile computing and smart devices, this program will promote the inclination and habit of intellectual inquiry conducive to a lifetime of learning.

C. **How the program fits with the institution’s mission, vision, values and reputation.**

The Mobile Application Development program is consistent with the missions of the university and the college by focusing on an emerging area to which graduates will be able to contribute their creative products and faculty/staff will be able to pursue new directions of scholarship.

From the RIT and NTID Mission Statements:

“**RIT’s mission is to provide a broad range of career-oriented educational programs with the goal of producing innovative, creative graduates who are well-prepared for their chosen careers in a global society.**

We rigorously pursue new and emerging career areas. We develop and deliver curricula and advance scholarship and research relevant to emerging technologies and social conditions.”

**NTID’s primary mission is “to provide deaf and hard-of-hearing students with outstanding state-of-the-art technical and professional education programs, complemented by a strong arts and sciences curriculum that prepares them to live and work in the mainstream of a rapidly changing global community and enhance their lifelong learning.”**

The Mobile Application Development program will be a new and innovative addition to the NTID education portfolio that will allow students to earn an associates’ degree in the new and rapidly growing field of mobile computing. Faculty will work collaboratively with industry partners to develop stimulating projects and foster experiential learning through capstone and co-op. The students will be well-prepared to meet the challenges of working in this growing field or to continue their education in other colleges within RIT.
1. **Innovative and well-prepared:**

   This is the first (and only) mobile application development program currently offered in New York State using a platform-agnostic (cross-platform) approach to teaching mobile application development. This innovative approach will open job opportunities for our students unavailable to native platform developers. Additionally, according to the NYS Inventory of Registered Programs, there are only three other associate degree level mobile app development programs offered in NYS, and two of them are offered in a distance learning only format. 

   Taking advantage of the eleven in-class technical courses dedicated specifically to mobile app development, much of the instruction in this program will be interactive and will include the use of new and emerging mobile smart devices, making students well-prepared to meet the demands of industry.

2. **Creative, collaborative and experiential:**

   The industry partnerships we have developed will offer the opportunity to create and implement real-world solutions to industry problems in capstone and co-op. This collaborative and experiential learning environment will provide students with a real-life learning environment to better prepare them for the workplace of the 21st century.

   The nature of this emerging, career-oriented Mobile Application Development program will require creativity from students in designing mobile applications. These apps will be designed and applied to state-of-the-art smart devices and wearable technologies.

   A learning support community established for each new year of students will allow faculty and students to work together on both in and out-of-class activities and promote peer support.

3. **Synergistic and interdisciplinary:**

   The NTID program is interdisciplinary, integrating the mobile application development technical courses with a business course (World of Business and Innovation) and a workplace related course (The World of Work) to provide students with a broader educational experience.

   The program provides for lifelong learning opportunities through a synergistic balance of technical credits and arts and science credits preparing students to work in a changing global community.

**D. Describe the justification and need for this program and how this program contributes to RIT’s strategic plan priorities and key result areas**

Due to the explosive growth in the use of mobile devices to access and use the Internet, there’s been a boom in the field of mobile application (app) development. In 2012, deployment and use of mobile applications created a $53 billion economy and by 2016, it is expected to rise to $143 billion. Additionally, by 2016, the global app economy is expected to account for 33% of the combined app services and handset market (up from 18% in 2012) which is an indication that the number of apps will continue to grow and outpace the value of handsets on a yearly basis.

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Smart phones, smart things, tablets and wearable devices will continue to change the way we communicate, do business and access news & entertainment. With that, the demand for new and innovative mobile apps is growing and will continue to grow. The increased demand “translates to one of the largest IT skills gaps ever realized – there are simply more mobile app development job openings than skilled application developers to fill them.”  

“ITCareerFinder, an on-line portal for helping IT professionals advance their careers, assembled a comparison of the decade’s hottest technology careers. These careers will experience the fastest growth through 2020, pay salaries well above the national average, boast top employment, and offer a range of advancement opportunities.”

According to ITCareerFinder, the Mobile Application Developer position was highlighted as being the best computer career for the future. The Bureau of Labor Statistics predicts that the number of Computer Software Programmer jobs will grow by 28% (much faster than average) from 2010 to 2020 and that mobile app developers will have approximately 82,000 jobs for associate degree holders during that period.

According to an article published by the Online Learning Consortium, “Mobile Apps are the fastest growing dimension of the mobile space in higher education right now, with impacts on virtually every aspect of informal life, and increasingly, every discipline in the university.”

From the RIT Strategic Plan:

“Our mission is to provide technology-based tracks for personal and professional development. We rigorously pursue new and emerging career areas. We develop and deliver curricula and advanced scholarship relevant to emerging technologies and social conditions.”

This program responds to employment opportunities in the new and emerging career area of mobile computing. Working with industry partners, students and faculty can engage in scholarship opportunities.

1. **Student Success**
   
   Student success will be realized by:
   
   a) students and faculty engagement through a learning support community.
   
   b) student, faculty and industry collaboration in the capstone course.
   
   c) student and faculty interaction in scholarship opportunities.
   
   d) real-world experience with industry partners offered through co-op.
   
   e) increased job opportunities because of cross-platform app development experience.

2. **Innovation, Creativity, Research and Scholarship**

   The nature of this emerging, career-oriented Mobile Application Development program will require creativity from students in designing mobile applications. These

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apps will be designed and applied to state-of-the-art smart devices and wearable technologies. Mobile devices are rapidly becoming universal as they are being adopted by many currently excluded groups who have never used computing devices before, including senior, disabled or illiterate individuals. To be successful, mobile application developers need to learn and incorporate universal design (assessable design) principles. NTID researchers in the Center of Access Technology are in the forefront of accessible design and access technologies as applied to deaf, hard of hearing and low vision. The combination of research expertise and consumer needs as it applies to universal/accessible design will result in many research and scholarship opportunities for faculty and deaf and hard-of-hearing students.

3. Organizational/Operational Excellence
The program will be assessed by both RIT’s comprehensive assessment review as well as by a diverse group of industry advisors providing continual feedback on areas where the program can be improved.

4. Stakeholder satisfaction
There will be several opportunities to assess stakeholder satisfaction. They are:

a) Students in the Mobile Application Development program will be assessed annually in terms of their satisfaction with the program and the department.

b) Students will be assessed by their employers at the end of the required co-op in the summer between their fourth and fifth semester.

c) Employer-partners from whom we get mobile app development projects will assess satisfaction with the student work at the end of the capstone course.

The results of the surveys will be reviewed annually by both the ICS department and Mobile App Development industry partners.

E. Describe curricular features that:

1. Facilitate and support student and faculty scholarship, research and creativity
The curriculum offers faculty and students opportunities for scholarship of discovery leading to the design and development of unique and creative apps. Apps designed for universal access in particular, will provide significant research and scholarship opportunities.

2. Address emerging disciplines
Mobile app development is an emerging discipline in the field of mobile computing. Students will be introduced to and will work with state-of-the-art mobile and wearable technologies to produce applications.

F. Description and list of documented curricular interconnections and integration between this program and other disciplines, programs and colleges at the University

The following courses are being taken outside of the Mobile Application Development program.

NACT-240 The World of Work: Students will take this course from the Career-Focused Applied Computer Technology program in the ICS department to prepare for the challenges of the workplace.
NBUS-211 World of Business and Innovation: Students will be encouraged to pursue entrepreneurial endeavors and as such, take a course offered by the NTID Business Studies department the focusing business studies including the topic of entrepreneurism.

NACA-172 Website Development: Students will take this course from the AS-BS degree program in ICS designed for transfer to the GCCIS IT program.

All liberal arts, science and Math courses: These courses provide a strong foundation for learning and for living and working in an increasingly diverse community and workplace.

Technical Electives: Eligible technical electives are shown in Table 1a with approvals noted in respective internal Letters of Support (Appendix C). Students can take a technical elective from the NACA or NACT programs in ICS, those wishing to continue their education for a baccalaureate degree will be encouraged to take their technical elective course in GCCIS’s IST department (specifically the IT program) to allow for maximum credit transfer.

G. Role of faculty in the program’s design
The proposed AAS in Mobile Application Development program was proposed and designed by the chairperson and the Mobile Application Development curriculum team in the NTID Information and Computing Studies Department. Several faculty members provided expertise in developing and reviewing proposed courses. Faculty from the entire department reviewed the full program proposal along with the new courses and provided feedback. Additionally, several faculty members from the GCCIS Information Sciences and Technologies (IST) and Interactive Games and Media (IGM) department reviewed the proposed coursework and provided feedback.

H. Input by external partners
A Curriculum Advisory Board was assembled to review the proposed Mobile App Development program. This board was comprised of nine representatives from the mobile computing Industry, three individuals from RIT BS level programs with strong knowledge of mobile app development, two from an out-of-state community college with a degree program in mobile app development and an NTID employment advisor.

The curriculum advisory board members who reviewed the Mobile Application Development program course mask and course descriptions are shown below. Qualifications can be found in Appendix D.

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Organization</th>
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<tbody>
<tr>
<td>Craig Lamb</td>
<td>Partner and CIO</td>
<td>Envative</td>
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<tr>
<td>David Mastrella</td>
<td>Partner and Chief Architect</td>
<td>Envative</td>
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<tr>
<td>Todd Bernhard</td>
<td>CEO</td>
<td>No Tie Software</td>
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<tr>
<td>Steve Maier</td>
<td>Senior Technical Evangelist</td>
<td>Microsoft</td>
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<tr>
<td>Ian Caspersson</td>
<td>President</td>
<td>IC9 Design</td>
</tr>
<tr>
<td>Mark Navarra</td>
<td>Recruiting Manager</td>
<td>Wellington Steele and Associates</td>
</tr>
<tr>
<td>R. John Gaudu</td>
<td>VP and Founding Partner</td>
<td>Wellington Steele and Associates</td>
</tr>
<tr>
<td>Paul Solt</td>
<td>CEO</td>
<td>Artwork Evolution</td>
</tr>
<tr>
<td>Jesse Black</td>
<td>Software Consultant</td>
<td>Self-Employed</td>
</tr>
<tr>
<td>Dr. Larry Ray</td>
<td>Program Chair</td>
<td>Stark State College, Canton, USA</td>
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</tbody>
</table>
After reviewing our program and curriculum plans with them, the advisory board provided input that was generally very positive and helpful. It is summarized in Appendix D. We were able to use their input to make program improvements that are reflected in the program mask, course descriptions and course outlines. Additionally, several members of the advisory board were eager to offer continued assistance in an advisory role, assist in faculty training, work with the students on capstone projects, consider hiring prospective graduates and even possibly provide some hardware and software. (See External Letters of Support in Appendix D)

I. Enrollment projections for Year 1 through Year 5

For two years, the ICS department in NTID has been offering a special topics course called “Windows Phone App Development”. Each time the course has been offered, we have achieved maximum class enrollment. Most of the students taking the course are either currently or formerly in one of ICS’ associate degree programs.

In the spring of 2014, the ICS department conducted a one-question clipboard survey for all students in the ICS department to gauge student interest in a program focusing on mobile app development. The question posed was, “If a program that teaches how to create apps on mobile devices (smartphones, tablets, etc.) were offered when you came to NTID, would you have considered applying to this program?” The results were profound. Of 51 respondents, 45 answered “Yes”.

Based on the app development course we offered, the student survey we conducted, program awareness opportunities through the NTID dual credit program (where students can take a pre-approved course in high school that awards both high school and college credit), and the natural affinity young people have for mobile devices, we anticipate this will be a popular program. Resource constraints however will require us to limit enrollment to 12 new students per year, with new students accepted only in fall semesters. Students accepted into this program will be screened to meet the enrollment criteria of this associate degree. The screening includes, but is not limited to math and English placement testing once they arrive at RIT, evaluation of transfer credits from other post-secondary institutions, and honors, AP or dual credits from high school.

Detailed Mobile Application Development enrollment projections, market analysis, and graduation rate projections that were reviewed and approved by Dr. Jim Miller, Senior VP of Enrollment Management and Career Services at RIT can be seen in Appendix B. The abbreviated table below shows the projected enrollment for five years and reflects an anticipated 80% retention through year one (Fall, Year 1 to Fall, Year 2) and 72% retention through year 2, (Fall, Year 2 to Fall, Year 3). At the end of fall semester, Year 3, nine students will have graduated from the program, taking the total number of students in the spring semester, Year 3 down to 22 from 31 in the fall semester.
2. Program Courses and Schedule

The proposed Mobile Application Development program offers a comprehensive curriculum designed with 77 total credits of which 49 are technical credits, 24 are liberal arts and science credits, three credits for a free elective and one for Freshman Seminar. The 77 credits hours will be taken over five semesters with one co-op experience between the fourth and fifth semester.

A. Required and elective courses in the program

AAS Credit Summary

- Total of 77 credits, 24 courses, projected over five academic semesters
- Technical Component = 49 credits / 15 courses (which includes one 3-credit Technical Elective)
- Liberal Arts and Sciences Components = 24 credits / 8 courses
- Other courses = 3 credits / 1 course Free Elective; 1 credit Freshman Seminar
- Wellness Education = 0 credit
- Co-op Work Experience between fourth and fifth semester

B. Courses in Table 1a that satisfy RIT’s General Education Framework

The following general education courses are part of Table 1a.

1. Foundation Courses
   a. UWRT-150 FYW: Writing Seminar
   b. LAS Elective

2. Perspectives for AAS Degree
   a. LAS- Perspective 1 (Ethical)
   b. LAS- Perspective 2 (Artistic)
   c. LAS- Perspective 3 (Global)
   d. LAS- Perspective 4 (Social)
   e. LAS- Perspective 6 (Scientific Principles)

3. Immersion – Not required for AAS degree

4. General Education Electives
   a. NMTH-255 Introduction to Discrete Mathematics
5. Wellness Education

C. Technical Courses

The technical courses that make up the Mobile Application Development program fit into four basic categories: Fundamentals, Development, Design and Other.

**Fundamentals:** App programming (coding) is typically the most difficult area for students to master. For this reason we are utilizing increased contact hours with students in the Programming Fundamentals I and II courses where we will introduce the programming language C#. Past experiences have shown that learning programming alone is not sufficient to gain a solid understanding of programming and how objects communicate with each other. For that reason, we developed a course called Software Analysis and Design. This course will emphasize the importance of writing good and efficient app programs, not just programs that work. The Web course will introduce students to basic HTML code so they can develop a simple website on which they can present a portfolio of projects they have worked on.
Development: We will be going beyond the fundamentals of C# and introduce Xamarin, a cross platform framework with the goal of creating apps that work across multiple platforms. As Steve Maier of Microsoft says, “I like your plans to use Xamarin and C# as the method of delivering the content to students.” [The plan] “has been well thought out and fits well into the market today and in the future. More and more apps are moving in a cross-platform direction and introducing students to this in the degree will definitely benefit them.” The Mobile App Development I and II courses will focus more on the back-end of programming and emphasize more on the overall app experience where performance and battery life are critical issues to address. The Web Services and Data Storage course will focus more on aggregating data from various sources across the web and displaying them in a space-efficient manner.

Design: Users expect great experiences and naturally we believe that apps must perform well and be complemented with pleasing aesthetics. A basic understanding of the design principles and app design guidelines will be taught in the Mobile User Interfaces course. To gain a better understanding of the user experience as it relates to app use is critical, which is why we developed the Mobile User Experience course to emphasize the importance of usability studies and user feedback. Students will learn the front-end development in the Mobile App Design Elements course and understand the various controls, navigation patterns and other UI elements.

Others: Another important area in the curriculum labeled “Other” include the Capstone Projects course where students, mentored by Mobile App Development faculty, will work with an employer-partner to develop an app that the employer needs. The employer will determine the requirements of the app and students will work with them to achieve the goal of producing a publishable app.

In the World of Business and Innovation course, students are exposed to typical business organizations, learn organizational structure, and gain a basic understanding of entrepreneurship. The World of Work course will also focus on the workplace, preparing students for job search, preparing resumes and reinforcing workplace principles such as workplace ethics and other soft skills necessary for gainful employment.

Improved Retention and Student Success through a Learning Support Community
An important aspect of this program will involve the use of a learning support community involving both Mobile App Development students and faculty. With the anticipated academic demand of the Mobile Application Development program, the establishment of a learning support community will serve to foster student retention and student success. This learning support community will bring students and faculty together in various activities such as code competition, guest speakers, code hour, team building exercises as a means of building self-confidence and promoting greater progress in academics. Faculty will not be the center of this learning support community, but become an advocate or mentor on the sidelines to support students and the learning support community outside of the classroom. Students will form relationships with other peer students and inherently develop life skills. Additionally, there will be industry experts getting involved in offering support and advice to the learning support community.
**The Mobile Application Development program Technical Elective can be: Web Implementation (NACA-174), Programming Fundamentals II (NACA-161), Web and Mobile I (ISTE-140), Intro to Database and Data Modeling (ISTE-230), Java for Programmers (ISTE-200), or a course from another program with approval of the ICS Department Chair and the Department Chair of the program offering the course.**
C. *See Appendix C for the following letters of support from other departments offering required courses*

1. **Elissa Olsen** – Department Chair, NTID Information and Computing Studies
2. **Mary Lou Basile** – Department Chair, NTID Business Studies
3. **Jennifer Gravitz** – Department Chair, NTID Liberal Studies
4. **Matthew Lynn** – Department Chair, NTID Science and Mathematics
5. **James Winebrake** – Dean, College of Liberal Arts

D. **Non-traditional schedule (e.g., off-campus, on-line, etc.)**

Not applicable. All of the courses will be offered on campus in classrooms or labs.

E. **Copy of the current catalog description for existing courses**

**NCAR-100 Freshman Seminar**
The course provides entering NTID students with opportunities to develop/enhance academic skills, personal awareness, and community involvement in order to maximize their college experience. Students have opportunities to explore and navigate the college environment, develop/reinforce academic skills and participate in service learning opportunities. Students are encouraged to establish meaningful connections with faculty, staff and peers. The course promotes the development of plans for ongoing growth and involvement in class and in the RIT/NTID and/or broader community.

*Class 1, Lab 1, Credit 1 (F,S)*

**NACA-172 Website Development**
This course introduces students to web page and small-scale website development. Through hands-on laboratory experiences, students will learn the fundamental concepts needed to construct web pages that follow appropriate coding standards as well as basic design principles to present content in an attractive and organized manner. Topics include HTML, CSS, graphical elements, website publishing, and transfer protocols.

*Class 2, Lab 3, Credits 3 (F,S)*

**NACT-240 The World of Work**
The goal of the course is to provide students with the business-related skills to acquire a cooperative or permanent job, and the personal and social skills to succeed on the job. Topics related to workplace communication and relationships, as well as financial management, employer expectations, and personal goal setting will also be covered. The course will also include the development of job search skills, resume writing and interviewing, along with skills in word processing, spreadsheets and presentation software as needed in the workplace.

*Class 3, Credits 3 (F)*

**NBUS-211 World of Business and Innovation**
This course is an overview of the functions and processes of business organizations. Topics include the roles and responsibilities of the manager, managing business ethics
and social responsibility, competing in a global environment, organizational structure and authority, and managing diversity, change, communication and innovation.

Class 3, Credits 3 (F,S)

UWRT-150 First Year Writing - Writing Seminar
First Year Writing is a three-credit seminar limited to 21 students per section. The course is designed to develop first-year students' proficiency in analytical writing, rhetorical reading, and critical thinking. Students will read, understand, and interpret a variety of texts representing different cultural perspectives and/or academic disciplines. Academic, non-fiction texts, chosen around a particular theme, are designed to challenge students intellectually and to stimulate their writing for a variety of contexts and purposes. Through inquiry-based assignment sequences, students will develop academic research and literacy practices that will be further strengthened throughout their academic careers. Particular attention will be given to the writing process, including an emphasis on teacher-student conferencing, self-assessment, class discussion, peer review, formal and informal writing, research, and revision; small class size promotes frequent student-instructor and student-student interaction. The course also emphasizes the principles of intellectual property and academic honesty for both current academic and future professional writing.
Class 3, Credit 3 (F, S, Su)

F. See Appendix A for new course outlines
3. Faculty

All of the NTID technical, mathematical and science courses are taught by NTID faculty who use direct instruction, including, but not limited to: sign language, spoken language, printed/visual aids, web-based instructional materials, and individual tutoring. The remainder of the courses in the AAS program will be taught by either NTID faculty who use direct instruction or by COLA faculty, depending on the courses and sections chosen to fulfill the liberal arts requirements.

Analysis shows a need for a total of 2.17 FTE to cover the ICS courses in this program. As shown in tables 2 and 4, one new FTE lecturer will be hired to cover two courses in the new program and six other ICS courses that are currently taught by the faculty who will be reassigned to teach the Mobile Application Development courses. The remaining 1.17 FTE will be covered by reassignments in faculty workload that have resulted in a capacity to offer more courses in the department. This additional capacity is primarily the result of two tenured faculty who had reduced teaching loads due to grant work now being assigned to full time grant work and having their teaching load covered by lecturers who can teach an additional number of courses beyond what the two tenured faculty were teaching.

There will be no impact on the course offerings for other ICS programs or the students’ ability to graduate on time.

Table 2: Current Faculty, Full-Time

<table>
<thead>
<tr>
<th>Faculty Member Name and Title/Rank at Institution (include and identify Program Director)</th>
<th>Program Courses which may be Taught</th>
<th>Percent of Teaching Time for Program Courses</th>
<th>Highest and Other Applicable Earned Degrees and Disciplines (include College/University)</th>
<th>Additional Qualifications: list related certifications/ licenses; professional experience in field, scholarly contributions, other academic affiliations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olsen, Elissa -Department Chair -Mobile Application Development Program Director -Assistant Professor</td>
<td>N/A</td>
<td>0%</td>
<td>M.S., Software Development and Management, Rochester Institute of Technology</td>
<td>21 years in Higher Education as Teacher and Administrator 13 years as Industry Programmer</td>
</tr>
<tr>
<td>Brian Trager -Assistant Professor</td>
<td>NMAD-181 Programming Fundamentals II: Mobile Domain  NMAD-182 Software Analysis and Design  NMAD-251 Mobile App Design Elements  NMAD-261 Mobile App Development II</td>
<td>66.67% (4 courses)</td>
<td>M.S., Information Technology, Rochester Institute of Technology</td>
<td>11 years Teaching in Higher Ed Almost $200,000 in Funded Research as PI or Co-PI Extensive Publications, Conference Presentations, CAID, SIGSCE, RESNA, SITE member</td>
</tr>
<tr>
<td>Name</td>
<td>Courses</td>
<td>Credits</td>
<td>Degree</td>
<td>Experience</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>---------</td>
<td>---------------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>Chris Campbell</td>
<td>NMAD-150 Mobile User Interfaces NMAD-260 Mobile App Develop I NMAD-270 Best Practices for Mobile Developers NMAD-262 Web Services and Data Storage Technologies</td>
<td>50%</td>
<td>M.S., Computer Information Systems, University of Phoenix</td>
<td>3 years Teaching in Higher Ed 12 years as Software Developer 3 years as Business Analyst</td>
</tr>
<tr>
<td>Raja Kushalnagar</td>
<td>NMAD-150 Mobile User Interfaces</td>
<td>25%</td>
<td>Ph.D. Computer Science, University of Houston</td>
<td>5 year Teaching in Higher Ed 5 years Industry Experience Certified Information Systems Security Professional (CISSP) Received over $375,000 in Funded Research as PI or Co-PI Extensive Peer-Reviewed and Published Research ACM, IEEE, USENIX member</td>
</tr>
<tr>
<td>Karen Beiter</td>
<td>NACT-240 The World of Work NACA-172 Website Development</td>
<td>33.34%</td>
<td>M.S. Computer Science, Rochester Institute of Technology</td>
<td>21 years Teaching in Higher Ed 11 years as Computer Systems Analyst Research experience in Assistive Technology ACM/SIGSCE member</td>
</tr>
<tr>
<td>Joseph Stanislow</td>
<td>NMAD-180 Programming Fundamentals I: Mobile Domain</td>
<td>16.67%</td>
<td>M.S. Computer Science Stevens Institute of Technology</td>
<td>13 years Teaching in Higher Ed 20 years Industry Experience CompTIA A+ Certification Extensive Research, Publications and Conference Presentations ACM, ASEE, CAID member</td>
</tr>
<tr>
<td>TBD (Lecturer to be hired)</td>
<td>NMAD-290 Mobile Application Development Capstone Projects NCAR-100 Freshman Seminar</td>
<td>25%</td>
<td>Unknown until the lecturer is determined</td>
<td>Unknown until the lecturer is determined</td>
</tr>
</tbody>
</table>
### Table 3: Current Faculty, Part-Time

<table>
<thead>
<tr>
<th>Faculty Member Name and Title/Rank at Institution (include and identify Program Director)</th>
<th>Program Courses which may be Taught</th>
<th>Highest and Other Applicable Earned Degrees and Disciplines (include College/University)</th>
<th>Additional Qualifications: list related certifications/licenses; professional experience in field, scholarly contributions, other academic affiliations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Table 4: Faculty to be Hired, Full-Time

In year two, the current ICS faculty teaching courses for the Mobile Applications Development program will not be able to teach courses which they currently teach. A new lecturer will have to be hired. When the new lecturer is hired, he/she will teach eight courses (such two courses for the Mobile Applications Development program NMAD-290 and NCAR-100 identified in Table 2) plus six ICS courses, such as those identified below in Table 4.

<table>
<thead>
<tr>
<th>Title/Rank of Position</th>
<th># of New Positions</th>
<th>Minimum Qualifications (including degree and discipline area)</th>
<th>Expected course assignments</th>
<th>Expected Hiring Date (mm/dd/yy)</th>
</tr>
</thead>
</table>
| Lecturer | 1 | MS in Computer Science, Information Technology or related discipline | NACT-120 Introduction to Computer Applications  
NACT-151 Windows Operating Systems  
NACT-170 Introduction to Website Development  
NACT-230 Introduction to Programming  
NACT-235 Introduction to Database Applications  
NACT-240 The World of Work | 08/22/2017 |

The NTID Department of Science and Mathematics will be teaching one mathematics course for this program to be offered once a year and the NTID Business Studies Department will teach one course from their program. As can be seen in the letters of support in Appendix C, both of these can be accomplished with current mathematics and business department faculty resources. As we continue to refine the course offerings, where appropriate, we may solicit the expertise of other departments if their skill sets fit areas of needed expertise.

If needed, the ICS department maintains a list of adjunct faculty available for courses in our programs.

See Appendix F for the Curricula Vitae of faculty listed in Table 2.
4. Financial Resources and Instructional Facilities

A. Instructional facilities and equipment needed to ensure the success of the program

1. Space
With the additional 12 students per year students and the addition of 14 new courses (including special topics, independent study, Mobile Application Development co-op) to the ICS portfolio of courses, lecture and lab space will be impacted. There is a pending move of the ICS department from the HLC building to the LBJ building. In the most recent design there is an (approximate) 450 sq. ft. lab designated for the Mobile Application Development lab. With two classrooms dedicated to the ICS department in the most recent design, there will be sufficient classroom space for the Mobile Application Development program (as well as current ICS programs).

In a letter of support provided by Erwin Smith, Assistant Vice President for Information Technology and College Operations dated 10/24/2014, he writes: “NTID is renovating nearly 9,000 sq. ft. in LBJ Hall to support the Information Computing Studies programs. Approximately 450 sq. ft. on the 1st floor of LBJ Hall will be allocated to the proposed Mobile Application Device (MAD) program. NTID is working with FMS and HBT Architects to finalize the design and construction schedule.” See Allocation for Space Request in Appendix E.

2. Lab or studio space/equipment to be shared
Two labs, one to be used as a general ICS “Self-Instruction Lab” (in which students in all ICS programs can work on homework, get course tutoring, check electronic communications, etc.), and another, the “Multimedia Lab” will be shared with other ICS programs. Classroom space will also be shared with other ICS programs. See Appendix C for the letter of support from Elissa Olsen, Chairperson of ICS indicating approval for shared space.

3. Equipment specific to the Mobile Application Development program
Because mobile devices become dated so quickly, we anticipate a need to annually replace a portion of the smart devices used for app development at an anticipated cost of approximately $2000/yr. These can be obtained through the NTID annual department equipment request, using department funds, grants, or may be obtained through industry partners/corporate donations.

4. Computer facilities
The Mobile Application Development lab and the ICS general purpose classrooms will be equipped with appropriate computer facilities to accommodate the maximum class size of 12 students. The lab will be equipped with sufficient benches, electrical capacity, internet connections, and computers.

5. Other space and equipment needs
There are no additional space needs.

We project an approximate $2000 annual software cost for cross-platform development kits. The software can be obtained using department funds, grants, or may be obtained through industry partners/corporate donations. Other needed software is readily available without an extra cost.
B. New program financial projections

The NTID cost model analysis in Appendix G prepared by Mr. Steve Morse, Assistant Vice President for NTID Finance and Budget, includes four tables detailing projected expenditures and revenue over the first five years of the program. There are no anticipated capital expenditures. New Program costs for each year over a three-year period are shown below in Table 5. These costs include faculty/staff salary and benefits plus costs such as computers, instructional supplies, telephone, software licenses, travel/conferences, and tuition payment for RIT credits.

Table 5, New Resources is shown below. For more information on the new program cost model, see Appendix G.

Information and Computing Studies Department

Mobile Application Development Associate of Applied Science Degree Program

Projected Expenditures For The Proposed Program

Table 5 – New Resources

Additional Salary & Benefits for 1.0 FTE Lecturer. This hire is required by the home department to teach other department courses (unrelated to this new program) starting in year 2 (2017-2018) which previously would have been taught by faculty teaching in this new program.

<table>
<thead>
<tr>
<th>New Expenditures</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
<td>$80,000</td>
<td>$83,000</td>
<td></td>
</tr>
<tr>
<td>Library</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplies &amp; Expenses (Other Than Personal Service)*</td>
<td>$26,200</td>
<td>$39,200</td>
<td>$45,400</td>
</tr>
<tr>
<td>Capital Expenditures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other **</td>
<td>$104,600</td>
<td>$137,500</td>
<td>$155,400</td>
</tr>
<tr>
<td>Total all</td>
<td>$130,800</td>
<td>$256,700</td>
<td>$283,800</td>
</tr>
</tbody>
</table>

* The amounts in this row represent RIT computer charges for students/faculty/staff involved in the program, Instructional supplies, telephone charges, software licenses, and travel/conferences for faculty. A breakdown of these expenses may be found on Table 1 – Projected Expenditures for the Proposed Program.

** The amounts in this row represent tuition payments for RIT credits and overhead (RIT indirect costs). A breakdown of these expenses may be found on Table 1 – Projected Expenditures for the Proposed Program.
5. Library Resources

A. Assessment of existing library resources by collection librarian

NTID Education Librarian, Joan Naturale, stated that “This program will have a minimal impact on the library’s services and collection of books, journals, and databases.”

Please refer to a supporting letter from Joan Naturale in Appendix C.

B. Institution’s response to identified needs

“The Wallace library’s Computer Science and Information Technology collection of journals, books, and databases supports the associate degree programs for the technical and design aspects of Mobile App Development.”

6. Admissions and Enrollment

A. List all program admissions requirements for the proposed program

Applicants must meet the general requirements for acceptance to RIT through NTID as detailed in RIT’s Undergraduate Bulletin. RIT and the U.S. Department of Education have agreed on these standards.

Entry criteria into this AAS degree program in Mobile Application Development will be based on the applicant’s projected ability to complete graduation within a typical program mask timeline. Incoming first-year NTID students pursuing this degree option will need to meet the following entry requirements:

**ACT:** Students with an ACT composite score of 17 or higher, with minimum scores of 18 in Mathematics, 16 in English, and 19 in Reading will be considered for direct admission to the program.

**English:** Placement in a First Year Writing course such as FYW: Writing Seminar (UWRT-150). Students that place into UWRT-100, Critical Reading and Writing would also be considered.

**Mathematics:** Placement in NTID Mathematics (NMTH-250) or higher. Typically, students entering this major will have completed at least three years of high school mathematics.

**Science:** Typically, students entering this major will have completed at least two years of high school science.

Internal transfer students who are pursuing this degree option will need to meet the entry requirements for this program as follows:

- Successful completion of NTID NMTH-212 level mathematics course (or equivalent)
- Successful completion of Critical Reading & Writing (UWRT-100) or equivalent;
- Overall GPA in courses at NTID/RIT of 2.8 or higher
B. Describe the process for evaluating exceptions to admission requirements

The department chairperson will reserve the right to evaluate borderline applicants through the normal NTID admission process.

C. How will the institution encourage enrollment by persons from groups historically described as underrepresented in the discipline or occupation?

The NTID Admissions Office will recruit and admit deaf and hard-of-hearing students both nationally and internationally. Recruitment practices and procedures will be in accordance with those established by NTID and RIT to promote diversity in the program.

7. Academic Support Services

The ICS department will use a variety of approaches to advise and counsel students in the Mobile Application Development program including use of the NTID Counseling and Academic Advising department who will assign an advisor/counselor to work with our department to serve these students.

Support Services typically used for baccalaureate level programs, including interpreting and note taking, are not applicable to this program (except for liberal arts courses taught by non-NTID faculty) since the Mobile Application Development program is designed as an associate (terminal) degree. However, should a student choose to transfer to a GCCIS program upon completion of this degree, NTID has maintained a strong commitment to the support of d/hh students in baccalaureate programs with special tutoring, interpreting/captioning, and note taking for each course.

8. External Review of Graduate Programs

Not applicable.

9. Credit for Experience

Substantial credit for prior learning derived from experience will not be granted for the Mobile Application Development program.

10. Program Assessment and Improvement

A. Program Level Outcomes Assessment

The essential goal of the Mobile Application Development program is to prepare students for employment as mobile application developers. Students will gain fundamental skills and knowledge related to mobile application development. The curriculum is designed to foster the development of both hard and soft skills that students will need to begin a successful career.

The curriculum, along with the Program Level Outcomes Assessment Plan, was designed to incorporate a broad view of the mobile application development field. The courses include instruction in object oriented programming, an introduction to HTML and
web development, user interface and user interactive design principles, web services, data acquisition and storage techniques, best practices as it relates to security and general design principles, and soft skills such as effective workplace communications, ethics and social responsibility.

The Mobile Application Development program aligns with the RIT academic program profile by providing students with knowledge and understanding of the following:

- Principles and practices of the mobile computing profession, where the outcomes of technical literacy, ethical reasoning and global interconnectedness are essential.
- Application planning and design that align well with the essential outcomes of critical, creative and innovative thinking.
- The impacts of mobile computing solutions in a global and societal context where outcomes of critical thinking, ethical reasoning, and integrative literacies are fundamental to improvements for society anywhere in the world.

See the Table 6 on the following page for the Outcomes Assessment Plan for the AAS in Mobile Application Development. The chairperson of the Information and Computing Studies department at NTID will coordinate the assessment process. Data will be collected and discussed at annual departmental meetings. Results of outcomes assessment measures and the use of results will be reported at the college level on a yearly basis and posted to RIT’s Assessment Management System website at http://www.taskstream.com. The AAS program will be evaluated, annually, based on student success in meeting the identified outcomes and consideration of emerging trends in liberal arts education.
## B. Program Level Outcomes Assessment Plan

**Table 6**  
**Program Name/College:** Mobile Application Development / National Technical Institute for the Deaf (NTID)  
**Program Contact for Program Assessment:** Elissa Olsen (Department Chair)

<table>
<thead>
<tr>
<th>Program Goals</th>
<th>Student Learning Outcomes</th>
<th>Academic Program Profile</th>
<th>Data Source/Measure Curriculum Mapping</th>
<th>Benchmark</th>
<th>Timeline</th>
<th>Data Analysis Key Findings</th>
<th>Use of Results Action Items and Dissemination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please List program-level goals</td>
<td>Students will be able to: (task, capability, knowledge, skills, and dispositions) Use measurable verbs.</td>
<td>Alignment to the five RIT essential outcomes - check all that apply</td>
<td>Assessment opportunity (course/experience) method/measures, assignment/rubric</td>
<td>Standard, target, or achievement level (usually a %) Statement of student success</td>
<td>Identify when and how data are collected, aggregated, and analyzed</td>
<td>Identify who is responsible and list key findings</td>
<td>Identify how results are used and shared. List any recommendatio ns or action items</td>
</tr>
<tr>
<td>Create effective software solutions.</td>
<td>Analyze real world problems and efficiently code solutions</td>
<td>☒ Critical Thinking ☒ Ethical Reasoning ☒ Integrative Literacies ☒ Global Interconnectedness ☒ Creative/Innovative Thinking</td>
<td>NMAD-181 Programming Fundamentals II: Mobile Domain Final Written Exam</td>
<td>80% of students will score a 75% or higher on exam.</td>
<td>Each semester the NMAD-181 Programming Fundamentals II: Mobile Domain course is offered.</td>
<td>Collected by ICS Dept. Assessment Coordinator</td>
<td>Shared with the program faculty, annual college summary report, NTID Annual Report, and the greater Institute as requested.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NMAD-181 Programming Fundamentals II: Mobile Domain Real world problem analysis - UML Diagram</td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>80% of the students will score a 75% or higher on the UML Diagram</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Given a UML diagram, 80% of the students will score a 75% or higher in being able to correctly and efficiently code a solution.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Program Goals</td>
<td>Student Learning Outcomes</td>
<td>Academic Program Profile</td>
<td>Data Source/Measure Curriculum Mapping</td>
<td>Benchmark</td>
<td>Timeline</td>
<td>Data Analysis Key Findings</td>
<td>Use of Results Action Items and Dissemination</td>
</tr>
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</tr>
<tr>
<td>Create effective and user-friendly mobile interfaces.</td>
<td>Design, refine and finalize a functional and user-friendly cross-platform user interface.</td>
<td>☒ Critical Thinking ☒ Ethical Reasoning ☐ Integrative Literacies ☐ Global Interconnectedness ☒ Creative/Innovative Thinking</td>
<td>NMAD-290 Mobile Application Development Capstone Projects Course Comprehensive</td>
<td>80% of students will score a 2 or higher with a rubric scale 0-3 on project sections related to being able to correctly and efficiently code a solution.</td>
<td>Each semester the NMAD-290 Mobile Application Development Capstone Projects course is offered.</td>
<td>Collected by ICS Dept. Assessment Coordinator</td>
<td>Shared with the program faculty, annual college summary report, NTID Annual Report, and the greater Institute as requested.</td>
</tr>
<tr>
<td>Publish applications across multiple platforms.</td>
<td>Create, secure, test and maintain mobile applications for two or more platforms</td>
<td>☒ Critical Thinking ☒ Ethical Reasoning ☐ Integrative Literacies ☐ Global Interconnectedness ☒ Creative/Innovative Thinking</td>
<td>NMAD-270 Mobile App Development II Final Exam or instructor evaluation (Project TBD) NMAD-290 Mobile Application Development Capstone Projects Course</td>
<td>80% of the students will earn a 75% or higher score on the NMAD Mobile App Design Elements Final Project. 80% of students will score a 2 or higher with a rubric scale 0-3 on the NMAD-289 Project.</td>
<td>Each semester the NMAD-270 Mobile App Development II course is offered. Each semester the NMAD-290 Mobile Application Development Capstone Projects course is offered.</td>
<td>Collected by ICS Dept. Assessment Coordinator</td>
<td>Shared with the program faculty, annual college summary report, NTID Annual Report, and the greater Institute as requested.</td>
</tr>
<tr>
<td>Program Goals</td>
<td>Student Learning Outcomes</td>
<td>Academic Program Profile</td>
<td>Data Source/Measure Curriculum Mapping</td>
<td>Benchmark</td>
<td>Timeline</td>
<td>Data Analysis Key Findings</td>
<td>Use of Results Action Items and Dissemination</td>
</tr>
<tr>
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<td>---------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
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<td>---------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Utilize effective professional</td>
<td>Demonstrate effective</td>
<td>Critical Thinking</td>
<td>NMAD-270 Mobile App Development II Team Project</td>
<td>100% of the students will demonstrate effective interpersonal and</td>
<td>Each Semester NMAD-270 Mobile App Development II is offered.</td>
<td>Collected by ICS Dept. Assessment Coordinator</td>
<td>Shared with the program faculty, annual college summary report, NTID Annual Report, and the greater Institute as requested.</td>
</tr>
<tr>
<td>communication and collaboration</td>
<td>verbal and written</td>
<td>Ethical Reasoning</td>
<td></td>
<td>communication skills on the team project rubric (peer and faculty</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>skills</td>
<td>communication skills</td>
<td>Integrative Literacies</td>
<td></td>
<td>evaluations)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Global Interconnectedness</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>Creative/Innovative Thinking</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Work effectively as a member of a team</td>
<td>NMAD-290 Mobile Application Development Capstone Projects Course</td>
<td>100% of students will score a 2 or higher with a rubric scale 0-3 on</td>
<td>Each semester the NMAD-290 Mobile Application Development Capstone Projects course is offered</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>project section sections related to interpersonal and communication skills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicate overall satisfaction with</td>
<td>Synthesize educational</td>
<td>Critical Thinking</td>
<td>Student satisfaction survey instrument</td>
<td>85% of students graduating will indicate &quot;satisfaction&quot; with Mobile</td>
<td>Collection: Annually at the end of the fall semester beginning AY 2019/2020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>the program and courses.</td>
<td>experience to determine</td>
<td>Ethical Reasoning</td>
<td>When the survey instrument is developed, indicate</td>
<td>Application Development courses and the program on the Student satisfaction survey instrument.</td>
<td>Collected by ICS Dept. Assessment Coordinator</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>level of satisfaction</td>
<td>Integrative Literacies</td>
<td>specific survey items that you will use for assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Global Interconnectedness</td>
<td>of this outcome.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Creative/Innovative Thinking</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Benchmark: Each Semester NMAD-270 Mobile App Development II is offered.
The student satisfaction survey instrument is developed, indicate specific survey items that you will use for assessment of this outcome.
C. Accreditation and Program Review

No external organizations other than NYSED and Middle States will evaluate/accredit the program.

11. New/Emerging Field and Allied Health Areas

Although this is an emerging program in the field of mobile computing, several such mobile app programs are already in place in other universities. The field of mobile computing has existed now for quite a few years.

12. Transfer to Baccalaureate Programs

The Mobile Application Development program is intended as a terminal degree. Once established, the ICS department will work to establish an articulation agreement with the RIT’s IST department. The IST department Coordinator, Dan Bogaard has reviewed the program mask and course descriptions for the Mobile Application Development program. As stated in his letter of support (see Appendix C), “…at least some of the technical courses will be able to transfer for credit towards a BS level degree in our department. Once the program gets fully approved and I have had the opportunity to review the complete syllabi, we can meet again to review course transferability and draft an articulation agreement.”

Entry into other four-year programs, either within or outside RIT may be possible as well, although the number of credits accepted for transfer may be less.

13. Application for Distance Education

Not applicable for this AAS degree program.
APPENDICES
## Appendix A - New or Revised Course Outline Form

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMAD-150</td>
<td>Mobile User Interfaces</td>
</tr>
<tr>
<td>NMAD-180</td>
<td>Programming Fundamentals I: Mobile Domain</td>
</tr>
<tr>
<td>NMAD-181</td>
<td>Programming Fundamentals II: Mobile Domain</td>
</tr>
<tr>
<td>NMAD-182</td>
<td>Software Analysis and Design</td>
</tr>
<tr>
<td>NMAD-250</td>
<td>Mobile User Experience</td>
</tr>
<tr>
<td>NMAD-251</td>
<td>Mobile App Design Elements</td>
</tr>
<tr>
<td>NMAD-260</td>
<td>Mobile App Development I</td>
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<tr>
<td>NMAD-261</td>
<td>Mobile App Development II</td>
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<tr>
<td>NMAD-262</td>
<td>Web Services and Data Storage Technologies</td>
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<td>NMAD-270</td>
<td>Best Practices for Mobile Development</td>
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<td>NMAD-290</td>
<td>Mobile Application Development Capstone Projects</td>
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<td>NMAD-299</td>
<td>Mobile Application Development Co-op</td>
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<tr>
<td>NMTH-255</td>
<td>Introduction to Discrete Mathematics</td>
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</table>
Information and Computing Studies

NEW COURSE: NTID-NMAD-150 Mobile User Interfaces

1.0 Course Designations and Approvals

<table>
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2.0 Course information:

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<td>Credit hours:</td>
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<td>Course proposed by:</td>
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All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

11/24/2014 DEL
2.b Student Requirements

Students required to take this course: (by program and year, as appropriate)
This is a required course by all students in the Mobile Application Development program.

Students who might elect to take the course:
Any student with department approval.

In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)

3.0 Goals of the course (including rationale for the course, when appropriate):

3.1 To learn terminology, concepts and principles in user interfaces.
3.2 To learn key players and their respective design guidelines.
3.3 To analyze interaction and application of basic user interfaces principles.
3.4 To learn to integrate individual user interface principles into mobile applications.
3.5 To design mobile applications that comply with best design practices.
3.6 To analyze and write reports on mobile application user interfaces.
3.7 To develop and refine reading skills to understand reference materials.
3.8 To develop and refine analysis and writing skills.

4.0 Course Description

NMAD-150 Mobile User Interfaces
User-centered, interactive design is critical to the development of successful consumer-level devices and software, particularly for mobile devices. This course provides students with a solid foundation in developing and understanding a comprehensive range of experiences in user-centered interactive design. The course will cover effective communication principles, user interface design techniques, design tools, workflow, design process, and user interaction. This course will also discuss universal design principles to provide full accessibility for all users.

(NACA-172) Class 2, Lab 2, Credit 3 (S)

5.0 Possible resources (texts, references, computer packages, etc.)

5.1 Possible Textbooks:


*Interaction Design: Beyond Human - Computer Interaction*; Yvonne Rogers,
5.2 *Instructional*: Instructional materials developed by the Information and Computing Studies Department.

5.3 *Software*: Image creation and manipulation software such as *Adobe Illustrator* Wireframing and storyboarding tools

---

6.0 **Topics (outline):**

6.1. Introduction to Mobile Interface Design
   6.1.1. Key players in mobile industry
   6.1.2. Distinctions between platforms

6.2. Communication Design Principles
   6.2.1. Effective Communication
   6.2.2. UI Core Principles

6.3. Interactive Design
   6.3.1. Interactions
   6.3.2. Controls
   6.3.3. Feedback
   6.3.4. Navigation
   6.3.5. Errors, warnings, notifications
   6.3.6. Dynamic elements

6.4. Visual Design
   6.4.1. Layout
   6.4.2. Typography
   6.4.3. Color
   6.4.4. Icons and glyphs
   6.4.5. Animation and transitions

6.5. Design Process and Workflow
   6.5.1. Identify design requirements
   6.5.2. Sketching
   6.5.3. Storyboarding
   6.5.4. Wire framing
   6.5.5. User feedback
   6.5.6. Managing design processes
   6.5.7. Platform-specific design guidelines

6.6. Interaction Styles
   6.6.1. Common design approaches
   6.6.2. Alternative design approaches
   6.6.3. App Design for users with disabilities

6.7. Mobile User Interface Guidelines, Principles, and Concepts

6.8. Design Issues
   6.8.1. Quality of Service
   6.8.2. Balancing Function and Fashion
   6.8.3. User Documentation and Online Help
   6.8.4. Information Search
   6.8.5. Information Visualization
7.0 **Intended course learning outcomes and associated assessment methods of those outcomes** (please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

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<thead>
<tr>
<th>Course Learning Outcome</th>
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<tbody>
<tr>
<td>7.1 Explain terminology, concepts and principles in human computer interaction. <em>(Goal 3.1)</em></td>
<td>Assignments and exams</td>
</tr>
<tr>
<td>7.2 Describe key events, people, and ideas in HCI <em>(Goal 3.2)</em></td>
<td>Assignments and projects</td>
</tr>
<tr>
<td>7.3 Explain, analyze and evaluate mobile user interfaces <em>(Goal 3.3)</em></td>
<td>Assignments, projects, and exams</td>
</tr>
<tr>
<td>7.4 Design and implement user interfaces <em>(Goal 3.4, 3.5)</em></td>
<td>Assignments, projects, and exams</td>
</tr>
<tr>
<td>7.5 Describe and summarize research papers on user interfaces <em>(Goal 3.6, 3.7, 3.8)</em></td>
<td>Assignments and projects</td>
</tr>
</tbody>
</table>

8.0 **Program outcomes and/or goals supported by this course embedded into the course, if appropriate**

**Program Goal(s)**
2. Create effective and user-friendly mobile interfaces
4. Utilize effective professional communication and collaboration skills

**Student Learning Outcome(s) for each goal**
2. Students will be able to design, refine and finalize a functional and user-friendly cross platform user interface.
4a. Students will be able to demonstrate effective verbal and written communication skills

9.0 **General Education Learning Outcome Supported by the Course, if appropriate**

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### Ethical, Social and Global Awareness

- Analyze similarities and differences in human experiences and consequent perspectives
- Examine connections among the world’s populations
- Identify contemporary ethical questions and relevant stakeholder positions

### Scientific, Mathematical and Technological Literacy

- Demonstrate knowledge of basic principles and concepts of one of the natural sciences
- Apply methods of scientific inquiry and problem solving to contemporary issues
- Comprehend and evaluate mathematical and statistical information
- Perform college-level mathematical operations or apply statistical techniques
- Describe the potential and the limitations of technology
- Use appropriate technology to achieve desired outcomes

### Creativity, Innovation and Artistic Literacy

- Demonstrate creative/innovative approaches to course-based assignments or projects
- Interpret and evaluate artistic expression considering the cultural context in which it was created

#### 10.0 Other relevant information (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

This course will be taught in the Mobile App Development lab or the Multimedia lab.
Information and Computing Studies

NEW COURSE: NTID-NMAD-180 Programming Fundamentals I: Mobile Domain

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All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

11/24/2014 DEL
2.b Student Requirements

**Students required to take this course:** (by program and year, as appropriate)
This will be a required course by all Mobile Application Design Development students in the AAS program.

**Students who might elect to take the course:**
Any student with department approval.

In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)

### 3.0 Goals of the course
(including rationale for the course, when appropriate):

3.1 To understand the development and documentation of algorithm logic by using tools such as flowcharts and pseudo code.
3.2 To develop analytical and problem solving skills using a decomposition paradigm.
3.3 To learn how to apply logic, analytical, and problem solving skills to solve programming problems using a contemporary object-oriented programming language.
3.4 To understand the Event model and implement basic interactive graphical interfaces.
3.5 To understand how to use software development processes to design good programs.
3.6 To develop the study skills and the independent learning skills needed to succeed in the Mobile Application Design and Development program.
3.7 To develop the writing skills needed to clearly explain the nature of a problem and possible solutions.
3.8 To develop the reading skills needed to understand technical materials such as books, journals, and manuals related to computing and problem solving concepts.

### 4.0 Course description
(as it will appear in the RIT Catalog, including pre- and co-requisites, and semesters offered). Please use the following format:

**NMAD-180 Programming Fundamentals I: Mobile Domain**

This course will provide students with a study of the fundamental concepts, logical structures, and algorithms inherent to computer programming. Students will learn how to write basic object-oriented programs in a contemporary programming language with a focus on mobile application development.

**Class 3, Lab 3, Credits 4 (F)**

### 5.0 Possible resources (texts, references, computer packages, etc.)

5.1 Possible Texts:


5.2 Instructional: Instructional materials developed by the Information and Computing Studies Department.

5.3 Software: Up-to-date SDKs and application development tools
6.0  Topics (outline):

6.1  Foundations of Problem Solving and Logical Thinking
   6.1.1  Problem solving methods
   6.1.2  Algorithms
   6.1.3  Boolean Logic

6.2  Foundations of the object-oriented approach
   6.2.1  Basic object-oriented concepts
   6.2.2  Thinking in object-oriented terms
   6.2.3  Principles of object-oriented design
      6.2.3.1  Anatomy of a class
      6.2.3.2  Class design guidelines
   6.2.4  Object-oriented Program Development Process
      6.2.4.1  Problem specification
      6.2.4.2  Problem Decomposition

6.3  Object-oriented constructs
   6.3.1  Class Definition
   6.3.2  Method Definition
   6.3.3  Instance
   6.3.4  Message Passing
   6.3.5  Encapsulation
   6.3.6  Hierarchy
   6.3.7  Inheritance
   6.3.8  Interfaces/Abstract classes
   6.3.9  Enumerations
   6.3.10  Collections
   6.3.11  Data and File Input/Output
   6.3.12  Serialization

6.4  Implementation language constructs
   6.4.1  Data types
   6.4.2  Data structures
   6.4.3  Conditional constructs
   6.4.4  Interactive constructs

6.5  Graphical User Interface
   6.5.1  Design principles and guidelines
   6.5.2  Events

6.6  Software solution implementation
   6.6.1  Solution design
   6.6.2  Solution implementation

6.7  Software solution testing
   6.7.1  Develop test cases
   6.7.2  Apply test cases to software solutions
   6.7.3  Basic debugging and design issues
### 7.0  Intended course learning outcomes and associated assessment methods of those outcomes

(please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

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<tr>
<td>7.1 Use problem solving logic to solve various case scenarios. <em>(Goal 3.1, 3.2)</em></td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.2 Create programs using a contemporary object-oriented programming language. <em>(Goal 3.3, 3.4)</em></td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.3 Use decomposition strategies to identify key areas in programming problems that will lead to the solution. <em>(Goal 3.3)</em></td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.4 Use correct procedures to analyze a problem, diagram (flow chart) the algorithm to solve the problem, and write the code that implements the algorithm. <em>(Goal 3.1, 3.2, 3.4)</em></td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.5 Implement an object-oriented design to solve a problem in a contemporary programming language. <em>(Goal 3.5)</em></td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.6 Write program documentation that clearly explains the purpose of the program and comments on the function of program logic. <em>(Goal 3.7)</em></td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.7 Read programming-related materials independently and correctly use a new feature (or features) of a programming language. <em>(Goal 3.6, 3.8)</em></td>
<td>class exercises and homework</td>
</tr>
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</table>

### 8.0  Program outcomes and/or goals supported by this course

**Program Goal(s)**
1. Create effective software solutions

**Student Learning Outcome(s) for each goal**
1. Students will be able to analyze real world problems and efficiently code solutions.

### 9.0  General Education Learning Outcome Supported by the Course, if appropriate

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**Intellectual Inquiry**

| Review, assess, and draw conclusions about hypotheses and theories |
| Analyze arguments, in relation to their premises, assumptions, contexts, and conclusions |
| Construct logical and reasonable arguments that include anticipation of counterarguments |
| Use relevant evidence gathered through accepted scholarly methods and properly acknowledge sources of information |

**Ethical, Social and Global Awareness**

| Analyze similarities and differences in human experiences and consequent perspectives |
| Examine connections among the world’s populations |
| Identify contemporary ethical questions and relevant stakeholder positions |

**Scientific, Mathematical and Technological Literacy**

| Demonstrate knowledge of basic principles and concepts of one of the natural sciences |
| Apply methods of scientific inquiry and problem solving to contemporary issues |
| Comprehend and evaluate mathematical and statistical information |
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| Describe the potential and the limitations of technology |
| Use appropriate technology to achieve desired outcomes |

**Creativity, Innovation and Artistic Literacy**

| Demonstrate creative/innovative approaches to course-based assignments or projects |
| Interpret and evaluate artistic expression considering the cultural context in which it was created |

10.0 **Other relevant information** (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

This course will be taught in the Mobile App Development lab or the Multimedia lab.
Information and Computing Studies

NEW (or REVISED) COURSE: NTID-NMAD-181 Programming Fundamentals II: Mobile Domain

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All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

2.b Student Requirements

**Students required to take this course:** (by program and year, as appropriate)
This is a required course by all students in the Mobile Application Development program.

**Students who might elect to take the course:**
Any student with department approval.

_In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)_

3.0 **Goals of the course** (including rationale for the course, when appropriate):

3.1 To develop an understanding of hierarchical information modeling using basic Unified Modeling Language.
3.2 To apply object-oriented principles using a contemporary object-oriented programming language.
3.3 To develop skills to implement more complex software solutions using a contemporary object-oriented programming language.
3.4 To understand how to use events and delegates to design and implement interactive graphical interfaces in mobile-oriented environments.
3.5 To apply application decoupling logic to produce improved program design and application performance.
3.6 To understand performance, connectivity, and energy issues within the mobile environment.
3.7 To develop the study skills and the independent learning skills needed to succeed in associate level courses.
3.8 To develop the writing skills needed to write program documentation that clearly explains the purpose of the program and comments on the function of program logic.
3.9 To develop the reading skills needed to understand technical materials such as books, journals, and manuals related to computing and problem solving concepts.

4.0 **Course description**

**NMAD-181 Programming Fundamentals II: Mobile Domain**
This course builds upon the programming skills developed in Programming Fundamentals I Mobile Domain and will cover more advanced object-oriented programming concepts, logical structures, and algorithms. Visual information system modeling, graphical user interfaces and software testing topics will also be covered. Students will be working individually on mobile-related projects as well as working with other students in team-based projects.

(NMAD-180) **Class 3, Lab 3, Credit 4 (S)**

5.0 **Possible resources** (texts, references, computer packages, etc.)

5.1 Possible Texts:

*Head First C#,* Jennifer Greene and Andrew Stellman, O’Reilly Media, 3rd
5.2 Instructional: Instructional materials developed by the Information and Computing Studies Department.

5.3. Software: Up-to-date SDKs and application development tools

6.0 Topics (outline):

6.1 Hierarchical Information Modeling
   6.1.1 Properties of hierarchical structures
   6.1.2 Using XML to model information hierarchies

6.2 Object-oriented constructs
   6.2.1 Modularity
   6.2.2 Encapsulation
   6.2.3 Hierarchy
   6.2.4 Inheritance
   6.2.5 Interfaces/Abstract classes
   6.2.6 Enumerations
   6.2.7 Collections
   6.2.8 Data and File Input/Output
   6.2.9 Serialization
   6.2.10 Exception Handling
   6.2.11 Data Binding
   6.2.12 Asynchronous Programming

6.3 Visual information system modeling - Unified Modeling Language
   6.3.1 UML elements
   6.3.2 UML structure diagrams

6.4 Graphical user interfaces
   6.4.1 Design principles and guidelines
   6.4.2 Data Templates
   6.4.3 Events
   6.4.4 Delegates

6.5 Algorithms for processing data and information structures

6.6 Application Logic Decoupling
   6.6.1 Design Patterns
   6.6.2 Architectural Patterns
   6.6.3 Secure programming techniques

6.7 Data-driven applications
   6.7.1 LINQ
      6.7.1.1 Queries
      6.7.1.2 Clauses

6.8 Software solution testing
   6.8.1 Develop test cases
   6.8.2 Apply test cases to software solutions
6.8.3 Debug basic design issues
6.8.4 Create internal program documentation

7.0 Intended course learning outcomes and associated assessment methods of those outcomes (please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

<table>
<thead>
<tr>
<th>Course Learning Outcome</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Use hierarchical information modeling to organize data into a tree-like structure and illustrate parent/child relationships. <em>(Goal 3.1)</em></td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.2 Represent an object-oriented problem in a UML design. <em>(Goal 3.1)</em></td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.3 Analyze a UML diagram to construct a problem. <em>(Goal 3.1)</em></td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.5 Apply the software development cycle using an object-oriented programming language. <em>(Goal 3.2, 3.3)</em></td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.6 Develop interactive programs with interactive, graphical screens. <em>(Goal 3.2, 3.4, 3.6)</em></td>
<td>class exercises, projects, quizzes, and tests</td>
</tr>
<tr>
<td>7.7 Develop programs that handle simultaneous events. <em>(Goal 3.2, 3.4)</em></td>
<td>class exercises, projects, quizzes, and tests</td>
</tr>
<tr>
<td>7.8 Use software testing strategies to debug and validate results. <em>(Goal 3.2, 3.3)</em></td>
<td>projects</td>
</tr>
<tr>
<td>7.9 Integrate all of the learned programming skills to create a software solution in a challenging, independent programming project. <em>(Goal 3.5, 3.6)</em></td>
<td>projects</td>
</tr>
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<td>7.10 Write program documentation that clearly explains the purpose of the program and comments on the function of program logic. <em>(Goal 3.7)</em></td>
<td>class exercises and homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.11 Read programming-related materials independently and correctly use a new feature (or features) of a programming language. <em>(Goal 3.8, 3.9)</em></td>
<td>class exercises and homework, tests</td>
</tr>
</tbody>
</table>

8.0 Program outcomes and/or goals supported by this course

Program Goal(s)
1. Create effective software solutions

Student Learning Outcome(s) for each goal
1. Students will be able to analyze real world problems and efficiently code solutions.

9.0 N/A
<table>
<thead>
<tr>
<th><strong>Communication</strong></th>
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<tr>
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<table>
<thead>
<tr>
<th><strong>Intellectual Inquiry</strong></th>
<th>Method</th>
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<tbody>
<tr>
<td>Review, assess, and draw conclusions about hypotheses and theories</td>
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<tr>
<td>Use relevant evidence gathered through accepted scholarly methods and properly acknowledge sources of information</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th><strong>Ethical, Social and Global Awareness</strong></th>
<th>Method</th>
</tr>
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<tbody>
<tr>
<td>Analyze similarities and differences in human experiences and consequent perspectives</td>
<td></td>
</tr>
<tr>
<td>Examine connections among the world’s populations</td>
<td></td>
</tr>
<tr>
<td>Identify contemporary ethical questions and relevant stakeholder positions</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Scientific, Mathematical and Technological Literacy</strong></th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain basic principles and concepts of one of the natural sciences</td>
<td></td>
</tr>
<tr>
<td>Apply methods of scientific inquiry and problem solving to contemporary issues</td>
<td></td>
</tr>
<tr>
<td>Comprehend and evaluate mathematical and statistical information</td>
<td></td>
</tr>
<tr>
<td>Perform college-level mathematical operations on quantitative data</td>
<td></td>
</tr>
<tr>
<td>Describe the potential and the limitations of technology</td>
<td></td>
</tr>
<tr>
<td>Use appropriate technology to achieve desired outcomes</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Creativity, Innovation and Artistic Literacy</strong></th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrate creative/innovative approaches to course-based assignments or projects</td>
<td></td>
</tr>
<tr>
<td>Interpret and evaluate artistic expression considering the cultural context in which it was created</td>
<td></td>
</tr>
</tbody>
</table>

**10.0 Other relevant information** (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

This course will be taught in the Mobile App Development lab.
Information and Computing Studies

NEW (or REVISED) COURSE: NTID-NMAD-182 Software Analysis and Design

1.0 Course Designations and Approvals

<table>
<thead>
<tr>
<th>Required course approvals:</th>
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<th>Is designation desired?</th>
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<tr>
<td>General Education:</td>
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<tr>
<td>Writing Intensive:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Honors</td>
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2.0 Course information:

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<thead>
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<tr>
<td>Credit hours:</td>
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<td>Prerequisite(s):</td>
<td>NMAD-180 Programming Fundamentals I: Mobile Domain</td>
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<tr>
<td>Co-requisite(s):</td>
<td></td>
</tr>
<tr>
<td>Course proposed by:</td>
<td>Mobile Application Development Curriculum Committee</td>
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<tr>
<td>Effective date:</td>
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<th>Contact hours</th>
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</tr>
<tr>
<td>Studio</td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
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</tbody>
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2.a Semester(s) offered (check)

<table>
<thead>
<tr>
<th>Fall</th>
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<th>X</th>
<th>Summer</th>
<th>Other</th>
</tr>
</thead>
</table>

All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

2.b Student Requirements

**Students required to take this course:** (by program and year, as appropriate)
This is a required course by all students in the Mobile Application Development program.

**Students who might elect to take the course:**
Any student with department approval.

In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)

3.0 **Goals of the course** (including rationale for the course, when appropriate):

3.1 To develop an understanding of hierarchical information modeling using basic Unified Modeling Language.
3.2 To create real-world solutions using general problem-solving guidelines.
3.3 To develop skills to implement software solutions using object-oriented design principles.
3.4 To apply application decoupling logic to produce improved program design and application performance.
3.5 To develop the study skills and the independent learning skills needed to succeed in baccalaureate level courses.
3.6 To develop the writing skills needed to write program documentation that clearly explains the purpose of the program and comments on the function of program logic.
3.7 To develop the reading skills needed to understand technical materials such as books, journals, and manuals related to computing and problem solving concepts.

4.0 **Course description**

**NMAD-182 Software Analysis and Design**

Building on the fundamentals of programming, students will learn important topics related to object-oriented design. Topics such as class design, unified modeling language, inheritance, composition, logic building, implementation, design strategies, and testing are emphasized. Upon completion, students will be able to demonstrate an understanding of the software development life cycle including a thorough analysis and design of a real-world software problem.

(NMAD-180) **Class 2, Lab 3, Credit 3 (S)**

5.0 **Possible resources (texts, references, computer packages, etc.)**

5.1 Possible Texts:


*Object-Oriented Analysis and Design with Applications*, Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Ph.D.,
5.2 Instructional: Instructional materials developed by the Information and Computing Studies Department.
5.3. Software: UML modeling tools, Microsoft Visio

6.0 Topics (outline):

6.1 Visual information system modeling - Unified Modeling Language
   6.1.1 UML elements
   6.1.2 UML structure diagrams
6.2 Anatomy of a Class
6.3 Class Design Guidelines
6.4 Object-Oriented Design
   6.4.1 Building Objects
   6.4.2 Portable Data
   6.4.3 Serialization
   6.4.4 Marshaling
   6.4.5 Databases
   6.4.6 Web Services
   6.4.7 Mobile Apps
6.5 Inheritance and Composition
6.6 Frameworks
6.7 Code Reuse
6.8 Design Patterns
   6.8.1 Gang of Four Pattern Compositions
   6.8.2 Compound Patterns
   6.8.3 Model View Controller/Model View View-Model
6.9 Decomposition
6.10 Principles and Strategies of Design Patterns
6.11 Software Development Lifecycle
6.12 Algorithms for processing data and information structures
6.13 Application Logic Decoupling

7.0 Intended course learning outcomes and associated assessment methods of those outcomes (please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

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<th>Course Learning Outcome</th>
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<td>At the completion of this course, students will be able to:</td>
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<td>7.1 Use hierarchical information modeling to organize data into a tree-like structure and illustrate parent/child relationships. <em>(Goal 3.1)</em></td>
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7.3 Create solutions using object-oriented analysis and design principles. *(Goal 3.2, 3.3)*  
Class exercises, homework, quizzes, and tests

7.4 Develop solutions that handle simultaneous events. *(Goal 3.2, 3.4)*  
Class exercises, projects, quizzes, and tests

7.5 Create testing strategies to debug and validate results. *(Goal 3.2, 3.3)*  
Projects

7.6 Integrate all of the learned program analysis and design skills to create a software solution in a challenging, independent programming project. *(Goal, 3.5)*  
Projects

7.7 Write program documentation that clearly explains the purpose of the program and comments on the function of program logic. *(Goal 3.6)*  
Class exercises and homework, quizzes, and tests

7.8 Read program analysis and design related materials independently and correctly use a new feature (or features) of a programming language. *(Goal 3.7)*  
Class exercises and homework, tests

### 8.0 Program outcomes and/or goals supported by this course

**Program Goal(s)**
1. Create effective software solutions

**Student Learning Outcome(s) for each goal**
1. Students will be able to analyze real world problems and efficiently code solutions.

### 9.0 N/A

<table>
<thead>
<tr>
<th>General Education Learning Outcome Supported by the Course, if appropriate</th>
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</table>
**Ethical, Social and Global Awareness**

- Analyze similarities and differences in human experiences and consequent perspectives
- Examine connections among the world’s populations
- Identify contemporary ethical questions and relevant stakeholder positions

**Scientific, Mathematical and Technological Literacy**

- Explain basic principles and concepts of one of the natural sciences
- Apply methods of scientific inquiry and problem solving to contemporary issues
- Comprehend and evaluate mathematical and statistical information
- Perform college-level mathematical operations on quantitative data
- Describe the potential and the limitations of technology
- Use appropriate technology to achieve desired outcomes

**Creativity, Innovation and Artistic Literacy**

- Demonstrate creative/innovative approaches to course-based assignments or projects
- Interpret and evaluate artistic expression considering the cultural context in which it was created

### 10.0 Other relevant information

(such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

This course will be taught in the proposed Mobile App Development lab.
Information and Computing Studies

NEW COURSE: NTID-NMAD-250 Mobile User Experience

1.0 Course Designations and Approvals

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2.0 Course information:

<table>
<thead>
<tr>
<th>Course title:</th>
<th>Mobile User Experience</th>
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<tbody>
<tr>
<td>Credit hours:</td>
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<tr>
<td>Prerequisite(s):</td>
<td>NMAD-150 Mobile User Interfaces</td>
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<td>Co-requisite(s):</td>
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<td>Course proposed by:</td>
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<tr>
<td>All</td>
<td>X</td>
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All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

2.b Student Requirements

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<tr>
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</table>

In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)

3.0 Goals of the course (including rationale for the course, when appropriate):

| 3.1 To understand the principles of mobile user experiences (Mobile UX) |
| 3.2 To learn to apply UX principles and processes in developing mobile apps |
| 3.3 To develop collaborative skills with customers and programmers on design tasks |
| 3.4 To learn how to create and design usability studies with the development and customer teams |
| 3.5 To develop and refine interview and documentation skills with customers |
| 3.6 To develop the writing skills needed to write documentation with a clear analysis of principles and requirements within mobile user experiences |
| 3.7 To develop the reading skills needed to understand technical materials such as books, journals, and manuals related to computing and problem solving concepts. |

4.0 Course description

<table>
<thead>
<tr>
<th>NMAD-250</th>
<th>Mobile User Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>This course will help students develop a better understanding of the user experience and interaction in the mobile domain. Students will plan and execute various mobile design strategies with usability as the forefront of design. Students will apply best practices in gathering data from usability testing and conduct analysis to make changes that will lead to effective user interfaces. This course will also discuss universal design experiences to provide full accessibility for all users. (NMAD-150) Class 2, Lab 2, Credits 3 (F)</td>
<td></td>
</tr>
</tbody>
</table>

5.0 Possible resources (texts, references, computer packages, etc.)

5.1 Possible Textbooks:

Don’t Make Me Think, Revisited: A Common Sense Approach to Web Usability; Steve Krug; New Riders; 2014; IBSN: 978-0321965516.

Mobile Usability; Jakob Nielsen and Raluca Budiu; New Riders; 2012; IBSN: 978-0321884480.

Mobile User Experience: Patterns to Make Sense of it All; Adrian Mendoza; Elsevier Science; 2013; IBSN: 978-0596514822.

The UX Book: Process and Guidelines for Ensuring a Quality User Experience; Rex Hartson & Pardha Pyla; Morgan Kaufmann; 2012; IBSN: 978-

5.2 Instructional: Instructional materials developed by the Information and Computing Studies Department.

5.3. Software: Image creation and manipulation software such as Adobe Illustrator Wireframing and storyboarding tools

6.0 Topics (outline):

- 6.1 User Experience (UX) Principles
- 6.2 Mobile UX versus Desktop UX
- 6.3 Mobile Design Strategy
  - 6.3.1 Mobile Apps
  - 6.3.2 Mobile Web
  - 6.3.3 Tablets
  - 6.3.4 Phones
- 6.4 Mobile Performance Metrics
- 6.5 Mobile UX Patterns
- 6.6 Wireframing and Prototyping
- 6.7 Research and Evaluation Tools and Techniques
  - 6.7.1 Stakeholder Interviews
  - 6.7.2 Requirements Workshops
  - 6.7.3 Usability Tests
  - 6.7.4 Competitor Benchmarking
  - 6.7.5 Conducting Contextual Research
  - 6.7.6 Analytics
  - 6.7.7 Surveys
- 6.8 Accessibility

7.0 Intended course learning outcomes and associated assessment methods of those outcomes (please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

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<tr>
<th>Course Learning Outcome</th>
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<tbody>
<tr>
<td>7.1 Explain principles, terminology and concepts in UX. <em>(Goal 3.1)</em></td>
<td>Class exercises, homework, quizzes and tests</td>
</tr>
<tr>
<td>7.2 Explain, analyze and evaluate basic mobile application user experiences <em>(Goal 3.2)</em></td>
<td>Class exercises, homework, final project</td>
</tr>
<tr>
<td>7.3 Perform basic user experience studies and measures <em>(Goal 3.2)</em></td>
<td>Class exercises, homework, final project</td>
</tr>
<tr>
<td>7.4 Determine consumer needs and developer capabilities through user experience measures <em>(Goal 3.3)</em></td>
<td>Class exercises, homework, final project</td>
</tr>
<tr>
<td>7.5 Assess user experiences through consumer studies <em>(Goal 3.4)</em></td>
<td>Class exercises, homework, final project</td>
</tr>
<tr>
<td>7.6 Write a report on an user experience study for a group <em>(Goal 3.5)</em></td>
<td>Report</td>
</tr>
<tr>
<td>7.7 Describe industry and research papers on user experience <em>(Goal 3.6, 3.7)</em></td>
<td>Class exercises, homework, quizzes and tests</td>
</tr>
</tbody>
</table>

### 8.0 Program outcomes and/or goals supported by this course

**Program Goal(s)**
1. Create effective software solutions
2. Create effective and user-friendly mobile interfaces
4. Utilize effective professional communication and collaboration skills

**Student Learning Outcome(s) for each goal**
1. Students will be able to analyze real world problems and efficiently code solutions
2. Students will be able to design, refine and finalize a functional and user-friendly cross-platform user interface.
4a. Students will be able to demonstrate effective verbal and written communication skills.

### 9.0 General Education Learning Outcome Supported by the Course, if appropriate

<table>
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<tr>
<th>Communication</th>
<th><strong>Express oneself effectively in common college-level written forms using standard American English</strong></th>
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<td></td>
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<tr>
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<td><strong>Analyze similarities and differences in human experiences and consequent perspectives</strong></td>
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56
<table>
<thead>
<tr>
<th>Scientific, Mathematical and Technological Literacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrate knowledge of basic principles and concepts of one of the natural sciences</td>
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<tr>
<td>Interpret and evaluate artistic expression considering the cultural context in which it was created</td>
</tr>
</tbody>
</table>

10.0 Other relevant information (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

This course will be taught in the proposed Mobile App Development lab.
Information and Computing Studies

NEW COURSE: NTID-NMAD-251 Mobile App Design Elements

1.0 Course Designations and Approvals

Required course approvals:

<table>
<thead>
<tr>
<th>Approval request date:</th>
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<tr>
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Optional designations:

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<tr>
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2.0 Course Information:

Course title: Mobile App Design Elements
Credit hours: 3
Prerequisite(s): NMAD-150 Mobile User Interfaces
Co-requisite(s):
Course proposed by: Mobile Application Development Curriculum Team
Effective date: AY 2016/17

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2.a Semester(s) offered

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</table>

All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

2.b Student Requirements

**Students required to take this course:** (by program and year, as appropriate)
This is a required course by all students in the Mobile Application Development program.

**Students who might elect to take the course:**
Any student with department approval.

In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)

### 3.0 Goals of the course (including rationale for the course, when appropriate):

3.1 To learn the various navigation patterns across multiple platforms.
3.2 To learn key players in the mobile industry and their respective design philosophies.
3.3 To develop an interactive user interface across multiple platforms.
3.4 To understand how individual user interface controls, behaviors and navigation patterns integrate into mobile applications.
3.5 To develop mobile applications which comply with best design practices.
3.6 To improve program documentation within mobile application user interfaces.
3.7 To enhance the reading skills needed to understand technical materials such as books, journals, and manuals related to user interfaces on various platforms.

### 4.0 Course description (as it will appear in the RIT Catalog, including pre- and co-requisites, and semesters offered). Please use the following format:

**NMAD-251 Mobile App Design Elements**
This course focuses on the implementation of mobile navigation patterns across multiple platforms and examines the most appropriate uses for each platform. Students will learn how to implement various user interface controls, behaviors and navigation patterns. Topics such as project structure, layout systems, advanced UI and data templating will also be discussed. (NMAD-150) **Class 2, Lab 3, Credit 3 (F)**

### 5.0 Possible resources (texts, references, computer packages, etc.)

5.1 Possible Texts:


5.2 Instructional: Instructional materials developed by the Information and Computing Studies Department.

5.3 Software: Up-to-date SDKs and application development/design tools

### 6.0 Topics (outline):
6.1 Structure of an interface
  6.1.1 Pages
  6.1.2 Layout
  6.1.3 Views
  6.1.4 Storyboard
  6.1.5 Touch
6.2 User interface design paradigms
  6.2.1 iOS
  6.2.2 Android
  6.2.3 Windows
6.3 Behavior
  6.3.1 Events
  6.3.2 Animation
  6.3.3 Transitions
  6.3.4 Gestures
6.4 Forms
6.5 Tables
6.6 Navigation
  6.6.1 Patterns
  6.6.2 App structure
6.7 Tools
  6.7.1 Controls
  6.7.2 Extensions
  6.7.3 Custom Controls
  6.7.4 Components
6.8 Shared Projects
6.9 Design Strategies
  6.9.1 Form factors
  6.9.2 Mobile platforms

7.0 Intended course learning outcomes and associated assessment methods of those outcomes (please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

<table>
<thead>
<tr>
<th>Course Learning Outcome</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 To design and evaluate mobile user interfaces across multiple platforms (Goal 3.1)</td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.2 To develop applications that navigate across multiple pages. (Goal 3.1)</td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.3 To differentiate different UI controls, elements and navigation patterns across multiple platforms. (Goal 3.2)</td>
<td>class exercises, homework, quizzes, and tests</td>
</tr>
<tr>
<td>7.4 To develop interactive and intuitive applications using appropriate UI controls across multiple platforms. (Goal 3.3, 3.4, 3.5)</td>
<td>class exercises, homework, and projects</td>
</tr>
<tr>
<td>7.5 Create documentation that explains the design decisions reflected in the user interface chosen for an application. (Goal 3.6)</td>
<td>class exercises, homework, and projects</td>
</tr>
<tr>
<td>7.6 Describe and summarize user interfaces across multiple platforms. (Goal 3.7)</td>
<td>class exercises, homework, and projects</td>
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</table>
8.0 Program outcomes and/or goals supported by this course embedded into the course, if appropriate

<table>
<thead>
<tr>
<th>Program Goal(s)</th>
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<tbody>
<tr>
<td>1. Create effective software solutions</td>
<td></td>
</tr>
<tr>
<td>2. Create effective and user-friendly mobile interfaces</td>
<td></td>
</tr>
<tr>
<td>4. Utilize effective professional communication and collaboration skills</td>
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</table>

Student Learning Outcome(s) for each goal

1. Students will be able to analyze real world problems and efficiently code solutions.
2. Students will be able to design, refine and finalize a functional and user-friendly cross-platform user interface.
4a. Students will be able to demonstrate effective verbal and written communication skills.
4b. Students will be able to work effectively as a member of a team

9.0 General Education Learning Outcome Supported by the Course, if appropriate

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<tr>
<th>Communication</th>
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<td>Express oneself effectively in common college-level written forms using standard American English</td>
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**Creativity, Innovation and Artistic Literacy**

| **Demonstrate creative/innovative approaches to course-based assignments or projects** |   |
| **Interpret and evaluate artistic expression considering the cultural context in which it was created** |   |

**10.0 Other relevant information** (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

This course will be taught in the proposed Mobile App Development lab.
Information and Computing Studies

NEW (or REVISED) COURSE: NTID-NMAD-260 Mobile App Development I

1.0 Course Designations and Approvals

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2.0 Course information:

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<tr>
<td>Credit hours:</td>
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<td>Prerequisite(s):</td>
<td>NMAD-181 Programming Fundamentals II: Mobile Domain; NMAD-182 Software Analysis and Design</td>
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<td>Co-requisite(s):</td>
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<td>Course proposed by:</td>
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All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

2.b **Student Requirements**

**Students required to take this course:** (by program and year, as appropriate)
This is a required course by all students in the Mobile Application Development program.

**Students who might elect to take the course:**
Any student with department approval.

*In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)*

### 3.0 **Goals of the course** (including rationale for the course, when appropriate):

3.1 To develop an understanding of the mobile app development model.
3.2 To apply mobile app development principles using a contemporary programming language alongside a contemporary framework.
3.3 To develop and apply skills to implement simple and complex software solutions for mobile apps.
3.4 To understand and apply code-sharing strategies.
3.5 To understand navigation patterns and events to design and implement intuitive, interactive graphical interfaces in mobile-oriented environments.
3.6 To apply proper design patterns to produce improved program design and application performance.
3.7 To develop the writing skills needed to write program documentation that clearly explains the purpose of the program and comments on the function of program logic.
3.8 To develop the reading skills needed to understand technical materials such as books, journals, and manuals related to computing and problem solving concepts.

### 4.0 **Course description**

**NMAD-260 Mobile App Development I**

This course introduces mobile application development utilizing modern development tools to build apps on popular mobile platforms using a contemporary programming language. Students will learn and apply code-sharing techniques to create mobile applications in an efficient manner. This course will also examine mobile development tools, native UIs, navigation, and design patterns to build and publish mobile apps. (NMAD-181; NMAD-182) **Class 3, Lab 3, Credit 4 (F)**
5.0 Possible resources (texts, references, computer packages, etc.)

5.1 Possible Texts:


5.2 Instructional: Instructional materials developed by the Information and Computing Studies Department.

5.3 Software: Up-to-date SDKs, application development tools and/or 3rd party tools

6.0 Topics (outline):

6.1 Intro to Mobile Development
   6.1.1 Mobile Applications Development Lifecycle
   6.1.2 App stores and publishing options
   6.1.3 Mobile platforms and capabilities

6.2 Mobile Programming Development Model
   6.2.1 Up-to-date SDKs
   6.2.2 Third party tools
   6.2.3 Configuration of development platform
   6.2.4 Simulators and Devices
   6.2.5 Debugging strategies
   6.2.6 Mobile development tools and environments

6.3 Mobile UI Strategies
   6.3.1 Views
   6.3.2 View Controllers
   6.3.3 Layouts

6.4 Navigation Patterns

6.5 Code strategies
   6.5.1 Code-sharing
   6.5.2 Debugging
   6.5.3 Secure programming techniques

6.6 Graphics and animations

6.7 Data storage

6.8 Media

7.0 Intended course learning outcomes and associated assessment methods of those outcomes (please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

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<thead>
<tr>
<th>Course Learning Outcome</th>
<th>Assessment Method</th>
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</thead>
<tbody>
<tr>
<td>7.1 Compare and contrast multiple platforms in the mobile domain. (Goal 3.1, 3.2)</td>
<td>class exercises, homework, projects, and tests</td>
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<tr>
<td>7.2</td>
<td>Create interactive apps with interactive, graphical, and multiple screens utilizing platform-specific design guidelines. <em>(Goal 3.4)</em></td>
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<tr>
<td>7.3</td>
<td>Develop and integrate various types of media in mobile apps. <em>(Goal 3.3)</em></td>
</tr>
<tr>
<td>7.4</td>
<td>Develop, test, and build apps using mobile app development tools and environments. <em>(Goal 3.1, 3.2)</em></td>
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<tr>
<td>7.5</td>
<td>Develop intuitive, interactive programs with proper navigation patterns and events. <em>(Goal 3.5)</em></td>
</tr>
<tr>
<td>7.6</td>
<td>Demonstrate proper code-strategies to correctly implement code-sharing, debugging, and secure programming. <em>(Goal 3.6)</em></td>
</tr>
<tr>
<td>7.7</td>
<td>Use software testing strategies to debug and validate results. <em>(Goal 3.2, 3.3)</em></td>
</tr>
<tr>
<td>7.8</td>
<td>Integrate all of the learned mobile development topics to create a software solution in a challenging, independent programming project. <em>(Goal 3.3)</em></td>
</tr>
<tr>
<td>7.9</td>
<td>Write program documentation that clearly explains the purpose of the program and comments on the function of program logic. <em>(Goal 3.8)</em></td>
</tr>
<tr>
<td>7.10</td>
<td>Read programming-related materials independently and correctly use a new feature (or features) of a programming language. <em>(Goal 3.7, 3.9)</em></td>
</tr>
</tbody>
</table>

### 8.0 Program outcomes and/or goals supported by this course

Program Goal(s)
1. Create effective software solutions
2. Create effective and user-friendly mobile interfaces
4. Utilize effective professional communication and collaboration skills

Student Learning Outcomes for each goal
1. Students will be able to analyze real world problems and efficiently code solutions.
2. Students will be able to design, refine and finalize a functional and user-friendly cross-platform user interface.
4a. Students will be able to demonstrate effective verbal and written communication skills.
4b. Students will be able to work effectively as a member of a team

### 9.0 N/A

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<th>General Education Learning Outcome Supported by the Course, if appropriate</th>
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<tbody>
<tr>
<td>Communication</td>
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**Intellectual Inquiry**

| **Review, assess, and draw conclusions about hypotheses and theories** |  |
| **Analyze arguments, in relation to their premises, assumptions, contexts, and conclusions** |  |
| **Construct logical and reasonable arguments that include anticipation of counterarguments** |  |
| **Use relevant evidence gathered through accepted scholarly methods and properly acknowledge sources of information** |  |

**Ethical, Social and Global Awareness**

| **Analyze similarities and differences in human experiences and consequent perspectives** |  |
| **Examine connections among the world’s populations** |  |
| **Identify contemporary ethical questions and relevant stakeholder positions** |  |

**Scientific, Mathematical and Technological Literacy**

| **Explain basic principles and concepts of one of the natural sciences** |  |
| **Apply methods of scientific inquiry and problem solving to contemporary issues** |  |
| **Comprehend and evaluate mathematical and statistical information** |  |
| **Perform college-level mathematical operations on quantitative data** |  |
| **Describe the potential and the limitations of technology** |  |
| **Use appropriate technology to achieve desired outcomes** |  |

**Creativity, Innovation and Artistic Literacy**

| **Demonstrate creative/innovative approaches to course-based assignments or projects** |  |
| **Interpret and evaluate artistic expression considering the cultural context in which it was created** |  |

**10.0 Other relevant information** (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

This course will be taught in the proposed Mobile App Development lab.
Information and Computing Studies

NEW (or REVISED) COURSE: NTID-NMAD-261 Mobile App Development II

1.0 Course Designations and Approvals

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2.0 Course information:

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<td>Co-requisite(s):</td>
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All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

2.b Student Requirements

**Students required to take this course:** (by program and year, as appropriate)

This is a required course by all students in the Mobile Application Development program.

**Students who might elect to take the course:**

Any student with department approval.

In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)

3.0 **Goals of the course** (including rationale for the course, when appropriate):

3.1 To develop an advanced understanding of the cross-platform development model.

3.2 To apply advanced cross-platform development principles using a contemporary programming language.

3.3 To develop and apply skills to implement complex software solutions across multiple platforms.

3.4 To understand and apply code-sharing strategies to successfully execute apps on multiple platforms.

3.5 To understand how to implement program design patterns across multiple platforms to design and implement interactive graphical interfaces in mobile-oriented environments.

3.6 To apply proper design patterns to produce improved program design and application performance.

3.7 To develop the study skills and the independent learning skills needed to succeed in baccalaureate level courses.

3.8 To develop the writing skills needed to write program documentation that clearly explains the purpose of the program and comments on the function of program logic.

3.9 To develop the reading skills needed to understand technical materials such as books, journals, and manuals related to computing and problem solving concepts.

4.0 **Course description**

**NMAD-261 Mobile App Development II**

This course builds upon the cross-platform development skills developed in Mobile App Development I and will cover more advanced topics such as geolocation, web services, data acquisition, portable class libraries, shared projects, notifications, and other advanced APIs. Students will be expected to create and publish fully functional apps across multiple platforms. (NMAD-260) **Class 3, Lab 3, Credit 4 (S)**

5.0 **Possible resources (texts, references, computer packages, etc.)**

5.1 Possible Texts:

5.2 Instructional: Instructional materials developed by the Information and Computing Studies Department.

5.3. Software: Microsoft Visual Studio and Xamarin

6.0 Topics (outline):

6.1 Cross-Platform Development Model
   6.1.1 Code sharing strategies
   6.1.2 Frameworks
   6.1.3 Configuration of development platform
   6.1.4 Simulators and Devices
   6.1.5 Debugging strategies
   6.1.6 Xamarin tools

6.2 iOS
   6.2.1 View Controllers
   6.2.2 Navigation controllers
   6.2.3 Layouts
   6.2.4 XCode Storyboard

6.3 Android
   6.3.1 View Controllers
   6.3.2 Navigation controllers
   6.3.3 Layouts

6.4 User interfaces
   6.4.1 Mobile-oriented design layout

6.5 Services
   6.5.1 Location based
   6.5.2 Push Notifications

6.6 Application Logic Decoupling
   6.6.1 Portable Class Libraries
   6.6.2 Shared Projects
   6.6.3 Model-View-View Model/Model-View-Controller
   6.6.4 Secure programming techniques

7.0 Intended course learning outcomes and associated assessment methods of those outcomes (please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

<table>
<thead>
<tr>
<th>Course Learning Outcome</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning Outcomes</strong></td>
<td><strong>Assessment</strong></td>
</tr>
<tr>
<td>At the completion of this course, students will be able to:</td>
<td></td>
</tr>
<tr>
<td>7.1 Demonstrate proper code-strategies to correctly implement code-sharing, debugging, and secure programming. (Goal 3.1, 3.3)</td>
<td>class exercises, homework, projects, and tests</td>
</tr>
<tr>
<td>7.2 Create apps utilizing advanced concepts across multiple platforms. (Goal 3.2, 3.3)</td>
<td>class exercises, homework, projects, and tests</td>
</tr>
</tbody>
</table>
| 7.3 | Develop and integrate various types of media in mobile apps.  
*(Goal 3.3)* | class exercises, homework, projects, and tests |
| 7.4 | Develop, build, test, and publish apps using mobile app development tools and environments.  
*(Goal 3.2, 3.4)* | homework and projects |
| 7.5 | Develop intuitive, interactive programs utilizing proper design patterns across multiple platforms.  
*(Goal 3.5)* | class exercises, projects, quizzes, and tests |
| 7.6 | Demonstrate proper code-strategies to correctly implement code-sharing, debugging, and secure programming.  
*(Goal 3.6)* | class exercises, projects, quizzes, and tests |
| 7.7 | Use software testing strategies to debug and validate results.  
*(Goal 3.2, 3.3, 3.5)* | projects |
| 7.8 | Integrate all of the learned mobile development topics to create a software solution in a challenging, independent programming project.  
*(Goal, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6)* | projects |
| 7.9 | Write program documentation that clearly explains the purpose of the program and comments on the function of program logic.  
*(Goal 3.8)* | class exercises and homework, quizzes, and tests |
| 7.10 | Read programming-related materials independently and correctly use a new feature (or features) of a programming language.  
*(Goal 3.7, 3.9)* | class exercises and homework, tests |

**8.0 Program outcomes and/or goals supported by this course**

Program Goals & Student Learning Outcomes
1. Create effective software solutions
2. Create effective and user-friendly mobile interfaces
4. Utilize effective professional communication and collaboration skills

Student Learning Outcomes for each goal
1. Students will be able to analyze real world problems and efficiently code solutions.
2. Students will be able to design, refine and finalize a functional and user-friendly cross-platform user interface.
4a. Students will be able to demonstrate effective verbal and written communication skills.
4b. Students will be able to work effectively as a member of a team

**9.0 N/A**

<table>
<thead>
<tr>
<th>General Education Learning Outcome Supported by the Course, if appropriate</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication</strong></td>
<td></td>
</tr>
<tr>
<td>Express themselves effectively in common college-level written forms using standard American English</td>
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</tr>
<tr>
<td>Revise and improve written and visual content</td>
<td></td>
</tr>
<tr>
<td>Express themselves effectively in presentations, either in spoken standard American English or sign language (American Sign Language or English-based Signing)</td>
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<tr>
<td>Comprehend information accessed through reading and discussion</td>
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</tbody>
</table>
### Intellectual Inquiry

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Review, assess, and draw conclusions about hypotheses and theories</td>
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</tr>
<tr>
<td>Analyze arguments, in relation to their premises, assumptions, contexts, and conclusions</td>
<td></td>
</tr>
<tr>
<td>Construct logical and reasonable arguments that include anticipation of counterarguments</td>
<td></td>
</tr>
<tr>
<td>Use relevant evidence gathered through accepted scholarly methods and properly acknowledge sources of information</td>
<td></td>
</tr>
</tbody>
</table>

### Ethical, Social and Global Awareness

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
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<tbody>
<tr>
<td>Analyze similarities and differences in human experiences and consequent perspectives</td>
<td></td>
</tr>
<tr>
<td>Examine connections among the world’s populations</td>
<td></td>
</tr>
<tr>
<td>Identify contemporary ethical questions and relevant stakeholder positions</td>
<td></td>
</tr>
</tbody>
</table>

### Scientific, Mathematical and Technological Literacy

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain basic principles and concepts of one of the natural sciences</td>
<td></td>
</tr>
<tr>
<td>Apply methods of scientific inquiry and problem solving to contemporary issues</td>
<td></td>
</tr>
<tr>
<td>Comprehend and evaluate mathematical and statistical information</td>
<td></td>
</tr>
<tr>
<td>Perform college-level mathematical operations on quantitative data</td>
<td></td>
</tr>
<tr>
<td>Describe the potential and the limitations of technology</td>
<td></td>
</tr>
<tr>
<td>Use appropriate technology to achieve desired outcomes</td>
<td></td>
</tr>
</tbody>
</table>

### Creativity, Innovation and Artistic Literacy

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrate creative/innovative approaches to course-based assignments or projects</td>
<td></td>
</tr>
<tr>
<td>Interpret and evaluate artistic expression considering the cultural context in which it was created</td>
<td></td>
</tr>
</tbody>
</table>

### Other relevant information

*(such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)*

This course will be taught in the proposed Mobile App Development lab.
Information and Computing Studies

NEW COURSE: NTID-NMAD-262 Web Services and Data Storage Technologies

1.0 Course Designations and Approvals

<table>
<thead>
<tr>
<th>Required course approvals:</th>
<th>Approval request date:</th>
<th>Approval granted date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Unit Curriculum Committee</td>
<td>10/20/2014</td>
<td>10/22/2014</td>
</tr>
<tr>
<td>College Curriculum Committee</td>
<td>10/24/2014</td>
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<thead>
<tr>
<th>Optional designations:</th>
<th>Is designation desired?</th>
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<th>**Approval granted date:</th>
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<tr>
<td>General Education:</td>
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<td>Writing Intensive:</td>
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<td>Honors</td>
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2.0 Course information:

<table>
<thead>
<tr>
<th>Course title:</th>
<th>Web Services and Data Storage Technologies</th>
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</thead>
<tbody>
<tr>
<td>Credit hours:</td>
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<tr>
<td>Prerequisite(s):</td>
<td>NMAD-260 Mobile App Development I</td>
</tr>
<tr>
<td>Co-requisite(s):</td>
<td>Mobile Application Development Curriculum Team</td>
</tr>
<tr>
<td>Course proposed by:</td>
<td>Mobile Application Development Curriculum Team</td>
</tr>
<tr>
<td>Effective date:</td>
<td>AY 2016/17</td>
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</table>

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Maximum students/section</th>
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</thead>
<tbody>
<tr>
<td>Classroom</td>
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<tr>
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<td>3</td>
</tr>
<tr>
<td>Studio</td>
<td></td>
</tr>
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<td>Other (specify)</td>
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2.a Semester(s) offered (check)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
<th>X</th>
<th>Summer</th>
<th>Other</th>
</tr>
</thead>
</table>

All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

11/24/2014 DEL
2.b Student Requirements

**Students required to take this course:** (by program and year, as appropriate)
This is a required course by all students in the Mobile Application Development program.

**Students who might elect to take the course:**
Any student with department approval.

*In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)*

3.0 **Goals of the course** (including rationale for the course, when appropriate):

3.1 To understand the concepts of databases and data storage.
3.2 To learn how to store, update, and delete data using a common query language.
3.3 To learn about different mobile databases available for usage.
3.4 To develop cross-platform Web Services which transmit and retrieve data.
3.5 To develop and refine reading skills to read and understand reference materials
3.6 To develop and refine analysis and writing skills

4.0 **NMAD-262 Web Services and Data Storage Technologies**

Students learn how to consume server-side web services that can deliver data in different formats to a variety of applications by building on their previous experience with websites and applications. They use a hands-on approach to build and modify different types of databases for use with their web services while exploring how data can and why it should be shared by multiple devices and applications. Students also gain an understanding of how to detect different devices over the Internet and generate specific targeted content. Use of pre-existing components, APIs and frameworks to improve efficiency is also explored. Methods for efficient data-transfer, to increase battery life, are a key topic in this course. Students work individually, as well as with other students, to complete tasks. (NMAD-260) **Class 2, Lab 3, Credits 3 (S)**

5.0 **Possible resources (texts, references, computer packages, etc.)**

5.1 **Possible Textbooks:**


5.1 **Instructional:** Instructional materials developed by the Information and Computing Studies Department.

5.2 **Software:** Text editor software such as *Microsoft Visual Studio*

6.0 **Topics (outline):**

6.1 Introduction to Databases and Database Concepts
6.2 Structured Query Language (SQL)
6.3 Mobile Databases
6.3.1 Definition
6.3.2 Mobile Databases vs. Enterprise Databases
6.3.3 Mobile Database Network Topologies
6.3.4 Characteristics of Mobile Environments
6.3.5 Requirements and Expectations for Mobile Databases
6.3.6 Comparison of Mobile Database Products

6.4 Cross-Platform Web Services

7.0 **Intended course learning outcomes and associated assessment methods of those outcomes** (please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

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<tr>
<td>7.1 Explain database design concepts <em>(Goal 3.1)</em></td>
<td>Class exercises, homework, quizzes and tests</td>
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<tr>
<td>7.2 Write code that inserts, updates, and deletes data from a database <em>(Goal 3.2)</em></td>
<td>Class exercises, homework, quizzes and tests</td>
</tr>
<tr>
<td>7.3 Create Web Services that can retrieve data from a data source <em>(Goal 3.4)</em></td>
<td>Class exercises, homework, quizzes and tests</td>
</tr>
<tr>
<td>7.4 Create Web Services that can store or update data on a data source <em>(Goal 3.4)</em></td>
<td>Class exercises, homework, quizzes and tests</td>
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<tr>
<td>7.5 Describe mobile databases used in the industry and understand their strengths and limitations <em>(Goal 3.3, 3.5, 3.6)</em></td>
<td>Class exercises, homework, quizzes and tests</td>
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</tbody>
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8.0 **Program outcomes and/or goals supported by this course**

Program Goal(s)
1. Create effective software solutions
4. Utilize effective professional communication and collaboration skills

Student Learning Outcomes for each goal
1. Students will be able to analyze real world problems and efficiently code solutions.
4a. Students will be able to demonstrate effective verbal and written communication skills.
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9.0 **General Education Learning Outcome Supported by the Course, if appropriate**

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**Intellectual Inquiry**

| **Review, assess, and draw conclusions about hypotheses and theories** |  |
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**Ethical, Social and Global Awareness**

| **Analyze similarities and differences in human experiences and consequent perspectives** |  |
| **Examine connections among the world’s populations** |  |
| **Identify contemporary ethical questions and relevant stakeholder positions** |  |

**Scientific, Mathematical and Technological Literacy**

| **Demonstrate knowledge of basic principles and concepts of one of the natural sciences** |  |
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| **Describe the potential and the limitations of technology** |  |
| **Use appropriate technology to achieve desired outcomes** |  |

**Creativity, Innovation and Artistic Literacy**

| **Demonstrate creative/innovative approaches to course-based assignments or projects** |  |
| **Interpret and evaluate artistic expression considering the cultural context in which it was created** |  |

**10.0 Other relevant information** (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

This course will be taught in the proposed Mobile App Development lab.
Information & Computing Studies

NEW COURSE: NTID-NMAD-270 Best Practices for Mobile Development

1.0 Course Designations and Approvals

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<table>
<thead>
<tr>
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<th>Best Practices for Mobile Development</th>
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</thead>
<tbody>
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<tr>
<td>Prerequisite(s):</td>
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2.a Semester(s) offered (check)

Fall | Spring | X | Summer | Other

All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

11/24/2014 DEL
2.b Student Requirements

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<tbody>
<tr>
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</table>

In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)

3.0 Goals of the course (including rationale for the course, when appropriate):

3.1 To understand the principles of the software development process and best practices specifically for developing mobile applications.
3.2 To understand the principles of the quality management in testing mobile applications.
3.3 To understand the principles of project management to deliver and/or maintain software in a timely manner within budget and requirement constraints.
3.4 To develop collaborative skills with customers, programmers, and project team on projects.
3.5 To develop the technical writing skills for project and user documentation.
3.6 To develop and refine reading skills to understand reference materials.

4.0 Course description

<table>
<thead>
<tr>
<th>NTID-NMAD - 270</th>
<th>Best Practices for Mobile Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having already studied the process of creating mobile applications and submitting them to various marketplaces, students will apply best practices for designing, developing and promoting mobile solutions. Topics include coding standards, unit testing, configuring network servers, configuring information architecture, sustainability and security for mobile websites and applications. Students will analyze case studies and present demonstrations of security issues when transmitting and storing information.</td>
<td></td>
</tr>
<tr>
<td>(NMAD-260) Class 2, Lab 3, Credits 3 (S)</td>
<td></td>
</tr>
</tbody>
</table>

5.0 Possible resources (texts, references, computer packages, etc.)

5.1 Possible Texts:


5.2 Instructional: Instructional materials developed by the Information and Computing Studies Department.

5.3 Software: Visual Studio and/or 3\textsuperscript{rd} party tools

6.0 Topics (outline):

6.1 The Nature of Software
6.2 Software Engineering
6.3 Part One The Software Process
6.3.1 Software Process Structure
6.3.2 Process Models
6.3.3 Agile Development
6.3.4 Human Aspects of Software Engineering
6.4 Part Two Modeling
   6.4.1 Principles That Guide Practice
   6.4.2 Understanding Requirements
   6.4.3 Requirements Modeling: Scenario-Based Methods
   6.4.4 Requirements Modeling: Class-Based Methods
   6.4.5 Requirements Modeling: Behavior, Patterns, and Web/Mobile Apps
   6.4.6 Design Concepts
   6.4.7 Architectural Design
   6.4.8 Component-Level Design
   6.4.9 User Interface Design
   6.4.10 Pattern-Based Design
   6.4.11 Web App Design
   6.4.12 Mobile App Design
6.5 Part Three Quality Management
   6.5.1 Quality Concepts
   6.5.2 Review Techniques
   6.5.3 Software Quality Assurance
   6.5.4 Software Testing Strategies
   6.5.5 Testing Conventional Applications
   6.5.6 Testing Object-Oriented Applications
   6.5.7 Testing Web Applications
   6.5.8 Testing Mobile Apps
   6.5.9 Security Engineering
   6.5.10 Formal Modeling and Verification
   6.5.11 Software Configuration Management
   6.5.12 Product Metrics
6.6 Part Four Managing Software Projects
   6.6.1 Project Management Concepts
   6.6.2 Process and Project Metrics
   6.6.3 Estimation for Software Projects
   6.6.4 Project Scheduling
   6.6.5 Risk Management
   6.6.6 Maintenance and Reengineering
6.7 Part Five Advanced Topics
   6.7.1 Software Process Improvement
   6.7.2 Emerging Trends in Software Engineering
   6.7.3 Concluding Comments

7.0 Intended course learning outcomes and associated assessment methods of those outcomes (please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).
<table>
<thead>
<tr>
<th>Course Learning Outcome</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Explain principles, terminology, and concepts in the software process and best practices. <em>(Goal 3.1, 3.2, 3.3, 3.4, 3.5)</em></td>
<td>class exercises, homework, projects, and tests</td>
</tr>
<tr>
<td>7.2 Develop and integrate the modeling and design in signing mobile applications. <em>(Goal 3.2)</em></td>
<td>class exercises, homework, projects, and tests</td>
</tr>
<tr>
<td>7.3 Develop performance quality management in testing mobile applications. <em>(Goal 3.3)</em></td>
<td>class exercises, homework, projects, and tests</td>
</tr>
<tr>
<td>7.4 Determine and write consumer needs and developer capabilities in managing software projects. <em>(Goal 3.4, 3.5, 3.6)</em></td>
<td>class exercises, homework, projects, and tests</td>
</tr>
<tr>
<td>7.5 Demonstrate teamwork in projects. <em>(Goal 3.1, 3.2, 3.3, 3.4)</em></td>
<td>Assignments, Lab Activities, Peer Evaluations</td>
</tr>
</tbody>
</table>

8.0 **Program outcomes and/or goals supported by this course**

**Program Goal(s)**
1. Create effective software solutions
2. Create effective and user-friendly mobile interfaces
3. Publish applications across multiple platforms
4. Utilize effective professional communication and collaboration skills

**Student Learning Outcomes for each goal**
1. Students will be able to analyze real world problems and efficiently code solutions.
2. Students will be able to design, refine and finalize a functional and user-friendly cross-platform user interface.
3. Students will be able to create, secure, test and maintain mobile applications for two or more platforms.
4a. Students will be able to demonstrate effective verbal and written communication skills.
4b. Students will be able to work effectively as a member of a team

9.0

<table>
<thead>
<tr>
<th>General Education Learning Outcome Supported by the Course, if appropriate</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td></td>
</tr>
<tr>
<td>Express oneself effectively in common college-level written forms using standard American English</td>
<td></td>
</tr>
<tr>
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</tr>
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<td>Express oneself effectively in presentations, either in spoken standard American English or sign language (American Sign Language or English-based Signing)</td>
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</tr>
<tr>
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<td></td>
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</tbody>
</table>
### Intellectual Inquiry
- Review, assess, and draw conclusions about hypotheses and theories
- Analyze arguments, in relation to their premises, assumptions, contexts, and conclusions
- Construct logical and reasonable arguments that include anticipation of counterarguments
- Use relevant evidence gathered through accepted scholarly methods and properly acknowledge sources of information

### Ethical, Social and Global Awareness
- Analyze similarities and differences in human experiences and consequent perspectives
- Examine connections among the world’s populations
- Identify contemporary ethical questions and relevant stakeholder positions

### Scientific, Mathematical and Technological Literacy
- Demonstrate knowledge of basic principles and concepts of one of the natural sciences
- Apply methods of scientific inquiry and problem solving to contemporary issues
- Comprehend and evaluate mathematical and statistical information
- Perform college-level mathematical operations or apply statistical techniques
- Describe the potential and the limitations of technology
- Use appropriate technology to achieve desired outcomes

### Creativity, Innovation and Artistic Literacy
- Demonstrate creative/innovative approaches to course-based assignments or projects
- Interpret and evaluate artistic expression considering the cultural context in which it was created

### Other relevant information
(such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

This course will be taught in the Mobile App Development lab.
Information and Computing Studies

NEW COURSE: NTID-NMAD-290 Mobile Application Development Capstone Projects

1.0 Course Designations and Approvals

<table>
<thead>
<tr>
<th>Required course approvals:</th>
<th>Approval request date:</th>
<th>Approval granted date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Unit Curriculum Committee</td>
<td>10/20/2014</td>
<td>10/22/2014</td>
</tr>
<tr>
<td>College Curriculum Committee</td>
<td>10/24/2014</td>
<td>11/13/2014</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optional designations:</th>
<th>Is designation desired?</th>
<th>*Approval request date:</th>
<th>**Approval granted date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education:</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Writing Intensive:</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honors</td>
<td>No</td>
<td></td>
<td></td>
</tr>
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</table>

2.0 Course information:

<table>
<thead>
<tr>
<th>Course title:</th>
<th>Mobile Application Development Capstone Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit hours:</td>
<td>3</td>
</tr>
<tr>
<td>Prerequisite(s):</td>
<td>NMAD-261 Mobile App Development II, NMAD-262 Web Services and Data Storage Technologies, NMAD-270 Best Practices for Mobile Development</td>
</tr>
<tr>
<td>Co-requisite(s):</td>
<td></td>
</tr>
<tr>
<td>Course proposed by:</td>
<td>Mobile Application Development Curriculum Team</td>
</tr>
<tr>
<td>Effective date:</td>
<td>AY 2016/17</td>
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</table>

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Maximum students/section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>1</td>
</tr>
<tr>
<td>Lab</td>
<td>4</td>
</tr>
<tr>
<td>Studio</td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
</tr>
</tbody>
</table>

2.a Semester(s) offered (check)

| Fall | X |
| Spring | | |
| Summer | | |
| Other | | |

All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

11/24/2014 DEL
### 2.b Student Requirements

<table>
<thead>
<tr>
<th><strong>Students required to take this course:</strong></th>
<th>(by program and year, as appropriate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All students in the Mobile Application Development program.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Students who might elect to take the course:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Any student with department approval.</td>
</tr>
</tbody>
</table>

*In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)*

### 3.0 Goals of the course (including rationale for the course, when appropriate):

| 3.1 | To further students’ critical/innovative thinking skills in finding solutions to “world of work” mobile application design and development problems. |
| 3.2 | To improve ethical and professional protocol and behavior in the students’ approach to problem solving |
| 3.3 | To encourage students to incorporate and integrate teamwork in brainstorming solutions to technical problems. |
| 3.4 | To further develop students' group problem-solving and interpersonal skills. |
| 3.5 | To further develop students' general presentation skills. |
| 3.6 | To further develop students' technical writing skills. |
| 3.7 | To further develop students' reading skills needed to understand technical materials such as textbooks, professional journals, and manuals provided by equipment and software manufacturers. |

### 4.0 Course description

**NMAD-290 Mobile Application Development Capstone Projects**

Working in teams, students experience the analysis, design, implementation, testing and deployment of a mobile solution for a real-world client. Important topics from throughout their program of study are applied in this course. Faculty advisors facilitate student teams to demonstrate their skills in the applied project. Student teams make a technical presentation to their faculty advisors and participate in a public showcase of projects. (NMAD-261, NMAD-262, NMAD-270) **Class 1, Lab 4, Credits 3 (F)**

### 5.0 Possible resources (texts, references, computer packages, etc.)

<table>
<thead>
<tr>
<th>5.1 Instructional: Instructional materials developed by the Information and Computing Studies Department.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2 Software: Text editor software such as Microsoft Visual Studio 2013</td>
</tr>
</tbody>
</table>

### 6.0 Topics (outline):

<table>
<thead>
<tr>
<th>6.1 Conceptualization of the project; project planning, and management</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2 Design considerations</td>
</tr>
<tr>
<td>6.3 Development considerations</td>
</tr>
<tr>
<td>6.4 Testing considerations</td>
</tr>
<tr>
<td>6.5 Security considerations</td>
</tr>
<tr>
<td>6.6 Deployment considerations</td>
</tr>
<tr>
<td>6.7 Ethical concerns and considerations</td>
</tr>
<tr>
<td>6.8 Device and application troubleshooting</td>
</tr>
<tr>
<td>6.9 Collection and tabulation of data (as appropriate)</td>
</tr>
</tbody>
</table>
### Intended course learning outcomes and associated assessment methods of those outcomes

(please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

<table>
<thead>
<tr>
<th>Course Learning Outcome</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7.1 To further students’ critical/innovative thinking skills in finding solutions to “world of work” mobile application development problems. (3.1)</strong></td>
<td>Assignments, Lab Activities</td>
</tr>
<tr>
<td>7.1.1 Demonstrate understanding of project scope and benefits of project management including cost, time, equipment, and personal analysis.</td>
<td></td>
</tr>
<tr>
<td>7.1.2 Demonstrate knowledge of mobile application development practices as learned in the Mobile Application Design and Development program.</td>
<td></td>
</tr>
<tr>
<td>7.1.3 Demonstrate appropriate use of testing methodologies used to test and troubleshoot mobile applications.</td>
<td></td>
</tr>
<tr>
<td><strong>7.2 To improve ethical and professional protocol and behavior in the students’ approach to problem solving. (3.2)</strong></td>
<td></td>
</tr>
<tr>
<td>7.2.1 Identify ethical issues associated with problems and solutions.</td>
<td>Assignments, Lab Activities</td>
</tr>
<tr>
<td>7.2.2 Demonstrate professional behavior in dealing with all aspects of a team project.</td>
<td>Assignments, Lab Activities, Peer Evaluations</td>
</tr>
<tr>
<td><strong>7.3 To encourage students to incorporate and integrate teamwork in brainstorming solutions to technical problems (3.3)</strong></td>
<td></td>
</tr>
<tr>
<td>7.3.1 Demonstrate teamwork in brainstorming and finding possible solutions for a project.</td>
<td>Assignments, Lab Activities, Peer Evaluations</td>
</tr>
<tr>
<td><strong>7.4 To further develop students’ group problem-solving and interpersonal skills. (3.4)</strong></td>
<td></td>
</tr>
<tr>
<td>7.4.1 Demonstrate leadership and other interpersonal skills in working effectively with others.</td>
<td>Assignments, Lab Activities, Peer Evaluations</td>
</tr>
<tr>
<td><strong>7.5 To further develop students’ presentation skills (3.5)</strong></td>
<td></td>
</tr>
<tr>
<td>7.5.1 Demonstrate the ability to give a clear and concise presentation of the project to faculty and peers.</td>
<td>Presentations</td>
</tr>
<tr>
<td><strong>7.6 To further develop students’ technical writing skills (3.6)</strong></td>
<td></td>
</tr>
<tr>
<td>7.6.1 Demonstrate the ability to clearly articulate in writing all aspects of a project.</td>
<td>Assignments, Lab Activities</td>
</tr>
<tr>
<td><strong>7.7 To further develop students’ reading skills needed to understand technical materials such as textbooks,</strong></td>
<td></td>
</tr>
</tbody>
</table>
7.7.1 Demonstrate the ability to extract relevant information from available resources in an effort to find and document project solutions.

### 8.0 Program outcomes and/or goals supported by this course

**Program Goal(s)**
1. Create effective software solutions
2. Create effective and user-friendly mobile interfaces
3. Publish applications across multiple platforms
4. Utilize effective professional communication and collaboration skills
5. Indicate overall satisfaction with the program and courses.

**Student Learning Outcomes for each goal**

1. Students will be able to analyze real world problems and efficiently code solutions.
2. Students will be able to design, refine and finalize a functional and user-friendly cross-platform user interface.
3. Students will be able to create, secure, test and maintain mobile applications for two or more platforms.
4. Students will be able to demonstrate effective verbal and written communication skills.
4b. Students will be able to work effectively as a member of a team
5. Graduating students will synthesize educational experience to determine level of satisfaction.

### 9.0 General Education Learning Outcome Supported by the Course, if appropriate

<table>
<thead>
<tr>
<th>General Education Learning Outcome Supported by the Course, if appropriate</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication</strong></td>
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<td><strong>Intellectual Inquiry</strong></td>
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<td>Review, assess, and draw conclusions about hypotheses and theories</td>
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<tr>
<td>Analyze arguments, in relation to their premises, assumptions, contexts, and conclusions</td>
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</table>
### Ethical, Social and Global Awareness
- Analyze similarities and differences in human experiences and consequent perspectives
- Examine connections among the world’s populations
- Identify contemporary ethical questions and relevant stakeholder positions

### Scientific, Mathematical and Technological Literacy
- Demonstrate knowledge of basic principles and concepts of one of the natural sciences
- Apply methods of scientific inquiry and problem solving to contemporary issues
- Comprehend and evaluate mathematical and statistical information
- Perform college-level mathematical operations or apply statistical techniques
- Describe the potential and the limitations of technology
- Use appropriate technology to achieve desired outcomes

### Creativity, Innovation and Artistic Literacy
- Demonstrate creative/innovative approaches to course-based assignments or projects
- Interpret and evaluate artistic expression considering the cultural context in which it was created

### 10.0 Other relevant information
(such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

This course will be taught in the proposed Mobile App Development lab.
Information and Computing Studies Department

REVISED COURSE: NTID-NMAD-299- Mobile Application Development Co-op

1.0 Course Designations and Approvals

<table>
<thead>
<tr>
<th>Required course approvals:</th>
<th>Approval request date:</th>
<th>Approval granted date:</th>
</tr>
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<tbody>
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<tbody>
<tr>
<td>General Education:</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Writing Intensive:</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Honors</td>
<td>No</td>
<td></td>
<td></td>
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2.0 Course information:

<table>
<thead>
<tr>
<th>Course title:</th>
<th>Mobile Application Development Co-op</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit hours:</td>
<td>0</td>
</tr>
<tr>
<td>Prerequisite(s):</td>
<td>NACT-240 The World of Work</td>
</tr>
<tr>
<td></td>
<td>NMAD-261 Mobile App Development II</td>
</tr>
<tr>
<td></td>
<td>NMAD-270 Best Practices for Mobile Development</td>
</tr>
<tr>
<td></td>
<td>NMAD-262 Web Services and Data Storage</td>
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<tr>
<td>Co-requisite(s):</td>
<td></td>
</tr>
<tr>
<td>Course proposed by:</td>
<td>Mobile Application Development Curriculum Team</td>
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<td>Effective date:</td>
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<thead>
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<td></td>
</tr>
<tr>
<td>Lab</td>
<td></td>
</tr>
<tr>
<td>Studio</td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td>350 hours of program related work experience</td>
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</tbody>
</table>

2.a Semester(s) offered (check)

<table>
<thead>
<tr>
<th>Fall X</th>
<th>Spring X</th>
<th>Summer X</th>
<th>Other</th>
</tr>
</thead>
</table>

11/11/2014 BPT
All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

### 2.b Student Requirements

<table>
<thead>
<tr>
<th>Students required to take this course: (by program and year, as appropriate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All students in the Mobile Application Development program</td>
</tr>
</tbody>
</table>

| Students who might elect to take the course: |

*In the sections that follow, please use sub-numbering as appropriate (eg. 3.1, 3.2, etc.)*

### 3.0 Goals of the course (including rationale for the course, when appropriate):

3.1. To provide practical working experience that reinforces classroom instruction.

3.2. To develop on-the-job skills for future full-time employment.

### 4.0 Course description

<table>
<thead>
<tr>
<th>NMAD-299 Mobile Application Development Co-op</th>
</tr>
</thead>
<tbody>
<tr>
<td>This course provides students with a 350-hour work experience in the computer field. Students have an opportunity to gain experience on the job, to apply what they have learned in their course work, and to evaluate their own technical, communication, and interpersonal skills. Placement assistance is provided to help students find a relevant work experience. (NMAD-240, NMAD-261, NMAD-262, NMAD-270)</td>
</tr>
<tr>
<td>Class 0, Credit 0 (F, S, Su)</td>
</tr>
</tbody>
</table>

### 5.0 Possible resources (texts, references, computer packages, etc.)

5.1 Instructional: Supervisor and student self-evaluation of performance.

5.2 Department faculty

5.3 National Center on Employment staff and resources

### 6.0 Topics (outline):

6.1 Technical Skills

6.2 Communication skills

6.3 Interpersonal skills

### 7.0 Intended course learning outcomes and associated assessment methods of those outcomes (please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

<table>
<thead>
<tr>
<th>Course Learning Outcome</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Student completes a minimum of 350 hours of work as a computer technician (Goals 3.1 &amp; 3.2)</td>
<td>Faculty review of co-op placement</td>
</tr>
<tr>
<td>7.2 Student completes co-op self evaluation form and submits to Co-op Coordinator (Goals 3.1 &amp; 3.2)</td>
<td>Review of student's self-evaluation</td>
</tr>
<tr>
<td>7.3 Employer completes online evaluation and submits to RIT Co-op web site (Goals 3.1 &amp; 3.2)</td>
<td>Review of supervisor's evaluation</td>
</tr>
</tbody>
</table>

### 8.0 Program outcomes and/or goals supported by this course

Program Goals & Student Learning Outcomes

1. Create effective software solutions

2. Create effective and user-friendly mobile interfaces
3. Publish applications across multiple platforms
4. Utilize effective professional communication and collaboration skills
5. Indicate overall satisfaction with the program and courses.

Student Learning Outcomes for each goal
1. Students will be able to analyze real world problems and efficiently code solutions.
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3. Students will be able to create, secure, test and maintain mobile applications for two or more platforms.
4a. Students will be able to demonstrate effective verbal and written communication skills.
4b. Students will be able to work effectively as a member of a team
5. Graduating students will synthesize educational experience to determine level of satisfaction.

<table>
<thead>
<tr>
<th>9.0 N/A</th>
<th>General Education Learning Outcome Supported by the Course, if appropriate</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication</strong></td>
<td>Express themselves effectively in common college-level written forms using standard American English</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Revise and improve written and visual content</td>
<td></td>
</tr>
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<td></td>
<td>Express themselves effectively in presentations, either in spoken standard American English or sign language (American Sign Language or English-based Signing)</td>
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<td></td>
<td>Use relevant evidence gathered through accepted scholarly methods and properly acknowledge sources of information</td>
<td></td>
</tr>
<tr>
<td><strong>Ethical, Social and Global Awareness</strong></td>
<td>Analyze similarities and differences in human experiences and consequent perspectives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Examine connections among the world’s populations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identify contemporary ethical questions and relevant stakeholder positions</td>
<td></td>
</tr>
<tr>
<td><strong>Scientific, Mathematical and Technological Literacy</strong></td>
<td>Explain basic principles and concepts of one of the natural sciences</td>
<td></td>
</tr>
<tr>
<td>Apply methods of scientific inquiry and problem solving to contemporary issues</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comprehend and evaluate mathematical and statistical information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perform college-level mathematical operations on quantitative data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Describe the potential and the limitations of technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use appropriate technology to achieve desired outcomes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Creativity, Innovation and Artistic Literacy**

| Demonstrate creative/innovative approaches to course-based assignments or projects |
| Interpret and evaluate artistic expression considering the cultural context in which it was created |

**10.0 Other relevant information** (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)
NEW COURSE NTID-NMTH-255-Introduction to Discrete Mathematics

1.0 Course Designations and Approvals

<table>
<thead>
<tr>
<th>Required course approvals:</th>
<th>Approval request date:</th>
<th>Approval granted date:</th>
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<tbody>
<tr>
<td>Academic Unit Curriculum Committee</td>
<td>10-10-14</td>
<td>10-17-14</td>
</tr>
<tr>
<td>College Curriculum Committee</td>
<td>10-24-14</td>
<td>11-13-14</td>
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Optional designations:

<table>
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<tr>
<th>Is designation desired?</th>
<th>*Approval request date:</th>
<th>**Approval granted date:</th>
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</thead>
<tbody>
<tr>
<td>General Education: Yes: AAS</td>
<td>2-24-15</td>
<td>3-3-15</td>
</tr>
<tr>
<td>Writing Intensive: No</td>
<td></td>
<td></td>
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<tr>
<td>Honors No</td>
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2.0 Course information:

<table>
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<tr>
<th>Course title:</th>
<th>Introduction to Discrete Mathematics</th>
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</thead>
<tbody>
<tr>
<td>Credit hours:</td>
<td>3</td>
</tr>
<tr>
<td>Prerequisite(s):</td>
<td>UWRT-100 Critical Reading and Writing or equivalent; and NMTH-212-Integrated Algebra or appropriate math placement</td>
</tr>
<tr>
<td>Co-requisite(s):</td>
<td></td>
</tr>
<tr>
<td>Course proposed by:</td>
<td>Bonnie Jacob, Mitchell Bacot, Jacqueline McClive and Sharron Webster</td>
</tr>
<tr>
<td>Effective date:</td>
<td>AY 2016-2017</td>
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</table>

<table>
<thead>
<tr>
<th>Contact hours</th>
<th>Maximum students/section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>2</td>
</tr>
<tr>
<td>Lab</td>
<td>2</td>
</tr>
<tr>
<td>Studio</td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
</tr>
</tbody>
</table>
2.a Semester(s) offered (check)

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
<th>Other</th>
</tr>
</thead>
</table>

All courses must be offered at least once every 2 years. If course will be offered on a bi-annual basis, please indicate here:

2.b Student Requirements

Students required to take this course: Students enrolled in the Mobile Application Design Program

Students who might elect to take the course: Students who would like to prepare for successful completion of COS-MATH-131-Discrete Mathematics.

3.0 Goals of the course (including rationale for the course, when appropriate):

3.1 To provide knowledge of the mathematical concepts needed for mobile app development, and a foundation in introductory discrete mathematics principles in preparation for higher-level discrete mathematics courses.
3.2 To emphasize the interface between language (ASL and English), discrete mathematics, and symbol systems.
3.3 To develop reading, writing, and critical thinking skills related to discrete mathematics content.
3.4 To develop skills in communicating discrete mathematics ideas and conclusions in writing and face-to-face using English and ASL.

4.0 Course description (as it will appear in the RIT Catalog, including pre- and co-requisites, and semesters offered). Please use the following format:

NMTH-255 Introduction to Discrete Mathematics
This course utilizes a lecture/lab format to introduce discrete mathematics topics such as logic, sets, number systems, counting, functions, graph theory, sequences and recursion. The applications of these topics to various topics in computing will be emphasized. (UWRT-100 or equivalent and NMTH-212 or appropriate math placement score) Class 2, Lab 2, Credit 3 (S)

5.0 Possible resources (texts, references, computer packages, etc.)

5.1 Text: Kolman, Busby and Ross, Discrete Mathematical Structures.
5.2 Text: Rosen, Discrete Mathematics and its Applications.
5.3 Text: Johnsonbaugh, Discrete Mathematics.
5.4 Instructor-developed material

6.0 Topics (outline):

6.1 Logic
   6.1.1 Conjunction, disjunction and negation
   6.1.2 Tautologies and contradictions
   6.1.3 Logical implication and truth tables
   6.1.4 First order quantifiers
   6.1.5 Mathematical reasoning and proof*
6.2 Sets
6.2.1 Sets, subsets, power sets and Venn diagrams
6.2.2 Set representations
6.2.3 Intersections, unions and complements
6.3 Number Systems
6.3.1 The binary and hexadecimal systems
6.3.2 Divisibility and modular arithmetic
6.4 Counting
6.4.1 Permutations
6.4.2 Combinations
6.5 Functions
6.5.1 Relations
6.5.2 Equivalence relations
6.5.3 One-to-one, onto and inverse functions
6.5.4 Recursively defined functions
6.5.5 Mathematical induction*
6.6 Graph Theory
6.6.1 Graph families including complete graphs, cycles, trees, directed graphs and weighted graphs
6.6.2 Graph isomorphisms
6.6.3 Graph traversal problems
6.6.4 Graph coloring problems
6.7 Sequences
6.7.1 Fibonacci and other recursive sequences
6.7.2 Series and Sigma notation*

* indicates that topic is optional and may be covered at instructor’s discretion if time permits

7.0  **Intended course learning outcomes and associated assessment methods of those outcomes** (please include as many Course Learning Outcomes as appropriate, one outcome and assessment method per row).

<table>
<thead>
<tr>
<th>Course Learning Outcome</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1 Translate discrete mathematics symbolic statements into language (ASL and English) and the reverse. (3.2)</td>
<td>Homework and tests</td>
</tr>
<tr>
<td>7.2 Convert standard (base 10) numbers to other number systems and the reverse. (3.1)</td>
<td>Homework, tests, and labs</td>
</tr>
<tr>
<td>7.3 Apply logic to make and justify deductions about discrete mathematical concepts. (3.1, 3.3, 3.4)</td>
<td>Homework and labs</td>
</tr>
<tr>
<td>7.4 Solve counting problems and interpret answers in the context of the problem. (3.1, 3.2)</td>
<td>Homework and tests</td>
</tr>
<tr>
<td>7.5 Apply basic concepts and vocabulary related to sets. (3.1)</td>
<td>Homework and tests</td>
</tr>
<tr>
<td>7.6 Identify well-known graph families and pairs of isomorphic graphs. (3.1)</td>
<td>Homework and tests</td>
</tr>
<tr>
<td>7.7 Solve coloring and traversal problems on graphs. (3.1)</td>
<td>Homework, tests, and labs</td>
</tr>
<tr>
<td>7.8 Identify functions, equivalence relations, one-to-one functions, and onto functions. (3.1)</td>
<td>Homework and tests</td>
</tr>
<tr>
<td>7.9 Use and understand function notation including for recursively defined functions. (3.1, 3.2)</td>
<td>Homework and tests</td>
</tr>
<tr>
<td>7.10 Apply logic principles to English statements and interpret conclusions in English. (3.2, 3.3, 3.4)</td>
<td>Homework, tests, and labs</td>
</tr>
<tr>
<td>7.11 Identify patterns in sequences. (3.1)</td>
<td>Homework and tests</td>
</tr>
<tr>
<td>7.12 Interpret and apply sigma notation for series. (3.1, 3.2)</td>
<td>Homework and tests</td>
</tr>
</tbody>
</table>

### 8.0 Program outcomes and/or goals supported by this course

| 8.0 Program outcomes and/or goals supported by this course |
| N/A |

### 9.0 General Education Learning Outcome Supported by the Course, if appropriate

| Communication |
| **General Education Learning Outcome Supported by the Course, if appropriate** | Assessment Method |
| Express oneself effectively in common college-level written forms using standard American English | |
| Revise and improve written products | |
| Express oneself effectively in presentations, either in spoken standard American English or sign language (American Sign Language or English-based Signing) | |
| Comprehend information accessed through reading and discussion | |

| Intellectual Inquiry |
| Review, assess, and draw conclusions about hypotheses and theories | |
| Analyze arguments, in relation to their premises, assumptions, contexts, and conclusions | |
| Construct logical and reasonable arguments that include anticipation of counterarguments | |
| Use relevant evidence gathered through accepted scholarly methods and properly acknowledge sources of information | |

| Ethical, Social and Global Awareness |
| Analyze similarities and differences in human experiences and consequent perspectives | |
| Examine connections among the world’s populations | |
| Identify contemporary ethical questions and relevant stakeholder positions | |

<p>| Scientific, Mathematical and Technological Literacy |
| Demonstrate knowledge of basic principles and concepts of one of the natural sciences | |
| Apply methods of scientific inquiry and problem solving to contemporary issues | |
| X Comprehend and evaluate mathematical and statistical information | Final exam |
| X Perform college-level mathematical operations or apply statistical techniques | Final exam |</p>
<table>
<thead>
<tr>
<th>Describe the potential and the limitations of technology</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Use appropriate technology to achieve desired outcomes</td>
<td></td>
</tr>
</tbody>
</table>

**Creativity, Innovation and Artistic Literacy**

<table>
<thead>
<tr>
<th>Demonstrate creative/innovative approaches to course-based assignments or projects</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpret and evaluate artistic expression considering the cultural context in which it was created</td>
<td></td>
</tr>
</tbody>
</table>

10.0 **Other relevant information** (such as special classroom, studio, or lab needs, special scheduling, media requirements, etc.)

As with most of the NMTH courses, this course should be offered in a room with access to Smart Notebook and related software, and dual projectors because of the extensive use of technology.
Appendix B – Enrollment and Market Analysis

A. Detailed enrollment projections for the next five years

For two years, the ICS department in NTID has been offering a special topics course called “Windows Phone App Development”. Each time the course has been offered, we have achieved maximum class enrollment. Most of the students taking the course are either currently or formerly in one of ICS’ associate degree programs.

In the spring of 2014, the ICS department conducted a one-question clipboard survey for all students in the ICS department to gauge student interest in a program focusing on mobile app development. The question posed was, “If a program that teaches how to create apps on mobile devices (smartphones, tablets, etc.) were offered when you came to NTID, would you have considered applying to this program?” The results were profound. Of 51 respondents, 45 answered “Yes”.

Based on the app development course we offered, the student survey we conducted, program awareness through potential HS dual credit offerings and the natural affinity young people have for mobile devices, we anticipate this will be a popular program. Resource constraints however will require us to limit enrollment to 12 new students per year, with new student accepted only in fall semesters. Students accepted into this program will be screened to meet the enrollment criteria of this associate degree, The screening includes, but is not limited to math and English placement testing once they arrive at RIT, evaluation of transfer credits from other post-secondary institutions, and honors, AP or dual credits from high school.

The Appendix B Table below, details the 5-year Mobile Application Development program enrollment, persistence and graduation rate projections that were reviewed and approved by Dr. Jim Miller, Senior VP of Enrollment Management and Career Services at RIT. This table shows that we anticipate accepting one internal transfer student per year, one new student that will be accepted into the program that would come to NTID even if the program did not exist (per year), and 10 students that will be accepted into the program that would not otherwise come to NTID (per year). The table further reflects an anticipated 80% retention through year one (Fall, Year 1 to Fall, Year 2) and a 72% retention through year 2, (Fall, Year 2 to Fall, Year 3). At the end of fall semester, Year 3, 9 students will have graduated from the program, taking the total number of student in the spring semester, Year 3 down to 22 from 31 in the fall semester.
Appendix B Table

Mobile Application Development AAS Enrollment Projections

<table>
<thead>
<tr>
<th></th>
<th>Year 1 Internal Transfer</th>
<th>Year 1 Would come to NTID w/o program</th>
<th>Year 1 NEW to NTID</th>
<th>Year 2 Internal Transfer</th>
<th>Year 2 Would come to NTID w/o program</th>
<th>Year 2 NEW to NTID</th>
<th>Persisting</th>
<th>TOTAL</th>
<th>Year 3 Internal Transfer</th>
<th>Year 3 Would come to NTID w/o program</th>
<th>Year 3 NEW to NTID</th>
<th>Persisting</th>
<th>TOTAL</th>
<th>Year 4 Internal Transfer</th>
<th>Year 4 Would come to NTID w/o program</th>
<th>Year 4 NEW to NTID</th>
<th>Persisting</th>
<th>TOTAL</th>
<th>Year 5 Internal Transfer</th>
<th>Year 5 Would come to NTID w/o program</th>
<th>Year 5 NEW to NTID</th>
<th>Persisting</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment Fall Semester</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td>22</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>19</td>
<td>31</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>19</td>
<td>31</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>Enrollment Spring Semester</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td>22</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td>22</td>
<td>1</td>
<td>1</td>
<td>10</td>
<td>10</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Semesters of Enrollment</td>
<td>2</td>
<td>2</td>
<td>20</td>
<td>24</td>
<td>2</td>
<td>2</td>
<td>20</td>
<td>20</td>
<td>44</td>
<td>2</td>
<td>2</td>
<td>20</td>
<td>29</td>
<td>53</td>
<td>2</td>
<td>2</td>
<td>20</td>
<td>29</td>
<td>53</td>
<td>2</td>
<td>2</td>
<td>20</td>
<td>29</td>
</tr>
</tbody>
</table>

**B. Anticipated graduation rate**

The ICS department believes that the Mobile Application Development program will attain a graduation rate of approximately 70 percent (retaining 72% of students by fall, year 3) due to entry level screening, learning support community activities that will lead to increased student motivation, and industry collaboration and partnership efforts. Mobile Application Development enrollment, persistence and graduation rate projections were reviewed and approved by Dr. Jim Miller, Senior VP of Enrollment Management and Career Services at RIT.
C. Competing programs (regional and national)

According to the NYS Inventory of Registered Programs, [http://www.nysed.gov/heds/IRPSL1.html](http://www.nysed.gov/heds/IRPSL1.html) only three AAS degree programs were identified that closely related to Mobile Application Development in NYS. Two are distance learning programs and one is an in-class program. All three are sub-par to our program in terms of technical content.

Outside of NYS, there are also a limited number of associate degree programs focusing on Mobile Application Development.

The table below shows the three colleges in NYS offering a Mobile Application related program and a few of the colleges outside of NYS offering such a program.

<table>
<thead>
<tr>
<th>College</th>
<th>Location</th>
<th>Degree</th>
<th>Program</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pace University</td>
<td>Various, NY</td>
<td>AAS (online)</td>
<td>Mobile Application Development</td>
<td><a href="http://www.pace.edu/continuing-professional-education/mobile-applications">http://www.pace.edu/continuing-professional-education/mobile-applications</a></td>
</tr>
<tr>
<td>Rasmussen College</td>
<td>Various</td>
<td>AAS</td>
<td>Software Application Development</td>
<td><a href="http://www.rasmussen.edu/degrees/technology/computer-science/">http://www.rasmussen.edu/degrees/technology/computer-science/</a></td>
</tr>
<tr>
<td>Stark State College</td>
<td>N. Canton, OH</td>
<td>AAS</td>
<td>Mobile App Development</td>
<td><a href="http://www.starkstate.edu/academic-programs/mobile-app-development">http://www.starkstate.edu/academic-programs/mobile-app-development</a></td>
</tr>
</tbody>
</table>

D. Anticipated geographic draw (regional, national and international)

The NTID Admissions Office will recruit and admit deaf and hard-of-hearing students both nationally and internationally. Recruitment practices and procedures will be in accordance with those established by NTID and RIT.
E. Program delivery format (full-time, part-time, on-site, off-site, distance learning, weekend learning)

This program will have an in-class format and will predominantly serve full-time students who will be on campus two semesters each year.
Appendix C – Internal Letters of Support

Elissa Olsen, Department Chair
Jennifer Gravitz, Department Chair
Scott Hooker, Director of Admissions
Matthew Lynn, Department Chair
Mary Lou Basile, Department Chair
John Macko, Director NCE
Dan Bogaard, IST Coordinator
Stephen Jacobs, Professor
Steven Zilora, Department Chair
Joan Naturale, Deaf Education Librarian
Stephen Nelson, Director of Operations
James Winebrake, Dean

NTID Information and Computing Studies
NTID Department of Liberal Studies
NTID Enrollment Management
NTID Department of Science & Mathematics
NTID Business Studies
NTID Center of Employment
GCCIS Information Sciences and Technologies
GCCIS Interactive Games and Media
GCCIS Information Sciences and Technologies
RIT Wallace Library
NTID Access Services
COLA
To: NTID Curriculum Committee
From: Elissa Olsen, Administrative Chairperson
Information and Computing Studies Department
Date: October 24, 2014
Subject: Mobile Application Development – Associate Degree Program

This memo is to acknowledge my unequivocal support for Associate of Applied Science in Mobile Application Development. This program is a direct outcome of NTID’s intentional efforts to develop new programs and to the growing interest expressed by deaf and hard-of-hearing students in pursuing a career in Mobile Application Development. Internal and external letters of support document the need, demand, and attractiveness of an Associate of Applied Science in Mobile Application Development.

This new program addresses the fact that mobile devices in the workplace are not being used to their full potential. According to CompTIA, an IT trade association, stated “the possibilities available to enterprise users with smartphones and tablets are hampered by a fundamental lack of resources, personnel and education in creating an effective mobile workforce.” If approved, this new offering will strengthen NTID’s academic portfolio and provide a competitive advantage with other colleges with similar programs.

Classroom and lab utilization for Mobile Application Development program is integrated in the relocation plan for ICS Department move from Carey Hall to Johnson Hall. Mobile Application Development program will be able to share classroom, Multimedia Lab and Self-Instruction Lab (SIL). Additionally, the Mobile Application Development program will have its own designated lab. Regarding required courses, if Mobile Application Development students choose to take a course such as the NACA-161 or NACA-174 course as their technical elective the respective ICS program will accommodate them.

I am most optimistic and look forward with positive anticipation for the potential options and success this program will offer to our students.

Should you have further questions, please do not hesitate to contact me.
October 24, 2014

NTID Curriculum Committee
NTID
25 Andrews Memorial Drive
Rochester, NY 14634

RE: NTID Department of Information and Computing Studies
Mobile App Program Proposal

Dear Committee Members:

As chair of the NTID Department of Liberal Studies (DLS), I am writing to express my support for the Mobile App degree program proposed by the NTID Department of Information and Computing Studies.

Students in the proposed AAS degree program must complete First Year Writing: Writing Seminar, UWRT 150 and four general education perspective courses to satisfy its graduation requirements. If students enter the proposed AAS degree program and need developmental English coursework, they will be enrolled in the DLS Intensive English program (NENG 221, 222, 231 and 232) to gain the skills needed to progress to First Year Writing: Writing Seminar, UWRT 150.

Whether Mobile App students enter at the developmental course sequence or at the First Year Writing: Writing Seminar UWRT 150 level, DLS can and will accommodate them in our existing course offerings.

The proposed degree will provide an exciting academic program for students who continue to study at the baccalaureate level or who enter the workplace. On behalf of my DLS colleagues, the NTID Department of Liberal Studies is ready to support the ICS Mobile App students with the English and general education courses they need!

Very truly yours,

JENNIFER L. GRAVITZ

Jennifer L. Gravitz, J.D.
Associate Professor and Chair
NTID Department of Liberal Studies
October 24, 2014

Elissa Olsen
Chair, Information and Computing Studies
National Technical Institute for the Deaf
52 Lomb Memorial Drive
Rochester, New York 14623

Dear Elissa,

I am pleased to write this letter of support for the new Mobile Application Development Associates Degree program currently being developed at RIT/NTID. Once approved, I look forward to working with your department in the recruitment of new students.

With the use of mobile technology on the rise, and more importantly, with the popularity of apps for mobile devices, this is a perfect time to bring this program of study to RIT, giving us the advantage over other colleges across the country. For this program to be available to our deaf and hard-of-hearing population is even better. Young people today are very familiar with the variety of mobile applications on the market today, and for our students to be a part of this growing field will greatly benefit RIT.

As we look to the future academic component of NTID, it is important that we are cutting edge and incorporate programs of study that will use the latest technologies that are popular with students. The Mobile Application Development program will assist us in reaching enrollment goals, and students will be excited about this program. I am especially pleased to offer my support.

If you have any questions, please do not hesitate to contact me.

Sincerely yours,

Scott C. Hooker, Director
NTID Office of Admissions
Rochester Institute of Technology
October 23, 2014

Curriculum Review Committee,

I support the proposal for NMTH 255 - Introduction to Discrete Mathematics that has been developed by faculty members in my department. We have sufficient resources to offer this course once per year during spring semester to students who will be enrolled in the proposed Mobile Application Design & Development AAS program at NTID and/or who wish to prepare for the baccalaureate-level Discrete Mathematics (MATH 131) course offered by RIT's College of Science. Several faculty members in my department have experience teaching or tutoring in this area of mathematics and one of them is currently performing research in this field, so I am confident that we will be able to offer a quality course.

Sincerely,

[Signature]

Matthew A. Lynn, Ph.D.
Interim Chairperson and Associate Professor of Chemistry
October 24, 2014

To: NTID Curriculum Committee

I support the Mobile Applications Development AAS degree as proposed by the Information and Computing Studies (ICS) Department.

As part of this major, students will take *World of Business and Innovation* from the Business Studies Department in the Fall semester of their second year. This course will give the students a foundation of knowledge that will aid them when working for small or large businesses. It will also give them basic concepts to consider when starting a business of their own.

Our department is able to serve these students without additional cost if the number of students from ICS does not require a second section of the course. Having students take the course in their second year will help to ensure that the AAS students have the English reading and writing skills necessary to challenge this course. Currently our course enrolls only AS level Business students.

If you require further information, please contact me.

Mary Lou Basile
Chairperson
October 28, 2014

Mr. Brian Trager
Rochester Institute of Technology
National Technical Institute for the Deaf
Information and Computing Studies Department

Dear Mr. Trager:

The NTID Center on Employment (NCE) is in full agreement with the proposed establishment of a new Associate of Applied Science (AAS) in Mobile Application Design and Development program. The establishment of this AAS degree program is consistent with what the technology industry is seeking.

With the ever changing nature of the technology world, it is important that NTID Technical programs keep pace with what employers are seeking in skill level of college graduates. The Mobile Design and Development program will enhance NCE's opportunity to attract employers seeking our students and graduates for both co-op and full-time positions.

In addition, we are finding that more students considering NTID for their college degree are expecting to subsequently graduate with a BS degree. With a certain percentage of these students not fully academically ready for the BS level, the AAS degree program will allow them to strengthen their skills and be better prepared in two years to move into the BS degree programs.

NCE has continuously developed good working relationships with faculty from the Information and Computing Studies department, so we are fully prepared to assist the students as they complete the AAS degree and work with them as they seek entry level jobs or they enter their BS degree program.

We look forward to working with the Information and Computing Studies department on this new AAS degree program.

Sincerely,

John Macko
Director, NCE
Dear Dave -

At the Advisory Board meeting I had the opportunity to review the program mask and course descriptions and can say that at least some of the technical courses will be able to transfer for credit towards a BS level degree in our department. Once the program gets fully approved and I have the opportunity to see the complete syllabi, we can meet again to review course transferability and draft an articulation agreement.

I will support students in the Mobile App Development Program choosing to take either ISTE-140 or ISTE-200 or ISTE-230 as their technical elective in the third year.

Sincerely,

Daniel Bogaard
Associate Professor
Undergraduate Program Coordinator

October 21, 2014
RIT

Rochester Institute of Technology

2/20/14

David Lawrence
Information and Computing Studies
National Technical Institute for the Deaf

Dear David,

I am writing in support of NTID’s proposed AAS in Mobile Application Design and Development. Due to my work with MAGIC’s Mobile Zone initiative and in the Department of Interactive Games and Media I am conversant with the current state of the art in terms of current mobile development, right up to the work we’ve done in the last month or two to launch the AT & T Civic App Challenge today.

As a former adjunct in NTID’s department of Applied Computing Technology (the predecessor to ITS) and throughout my career as an RIT faculty member I have taught and/or mentored Deaf computing students. My most recent mentees are Motion Savvy team who are now funded members of the Leap Motion AXLRRR program and presenting at the AAS Emerging Researchers National Conference in STEM next week. I’ll be joining the team and Dr. Buckley when they present to CISCO in San Jose in March.

The mobile development world is one of the most vibrant sectors of computing today and its great to see the curriculum your department has developed. I believe it will provide them with a solid, foundational understanding of the different aspects of design required for mobile development and give them the skills they need to develop on their own and/or move into the IST BS program.

Congratulations on a solid effort and I look forward to seeing your students engaging with us in the MAGIC Center.

Sincerely,

Stephen Jacobs
Associate Director, RIT Center for Media, Arts, Games, Interaction & Creativity (MAGIC)
Professor, Interactive Games and Media
Rochester Institute of Technology
152 Lomb Memorial Drive
Bldg 70
Rochester, NY 14623
sj@mail.rit.edu
585-278-6118. Cell
October 21, 2014

David Lawrence
Information and Computing Studies
National Technical Institute for the Deaf

Dear Dave,

I am writing in support of NTID’s proposed AAS in Mobile Application Design and Development. Here in the Information Sciences and Technologies department we are seeing explosive growth in student interest in our mobile application development courses. This interest is driven not only by the natural affinity young people have with the mobile world, but also by the increasing demand for mobile application developers by employers. It is great to see you seizing the opportunity to provide this education for your students as well.

In reviewing your proposed curriculum, I can say that I believe you will be doing a very good job preparing your students for employment as well as preparing them to continue their studies with a BS in Information Technology should they so choose.

I look forward to our continued work together to provide the best possible opportunities for all our students. Please let me know if I can be of any additional help in getting this degree up and running.

Sincerely,

[Signature]

Prof. Stephen J. Zilora
Information Sciences and Technologies Department Chair
Memorandum

TO:  David Lawrence, Instructional/Support Faculty, Information and Computing Studies
     Elissa Olsen, Chair, Information and Computing Studies,
     Myra Pelz, Instructional/Support Faculty, Information and Computing Studies
     Brian Tager, Instructional/Support Faculty, Information and Computing Studies

CC:   Shirley Bower, Director, RIT Libraries
      Sheila Smokey, Manager, Acquisitions & Serials

FROM: Joan Naturale, NTID Librarian, RIT Libraries
DATE: October 16, 2014
RE:   Library support for proposed Mobile App Design and Development Associate Degree Program

The following outlines the impact of NTID’s Department Information and Computing Studies proposed Associate’s degree program in Mobile App Design and Development.

This program will have a minimal impact on the library’s services and collection of books, journals, and databases.

RIT Libraries now use a demand/user-driven model of acquisition for the majority of its book purchases, ensuring books purchased are those that users want.

Our current holdings (journals and databases) are at acceptable levels for associates’ level programs. This is based on requests for books not published yet and new journal titles.

The Wallace library’s Computer Science and Information Technology collection of journals, books, and databases supports the associate degree programs for the technical and design aspects of Mobile App Design and Development. There is a librarian content specialist for this content area (Roman Koshykar) and he works closely with Golisano College, ensuring the collection is up-to-date. His LibGuides on various computer-related topics can be accessed via this link: http://infoguides.rit.edu/cat.php?cid=32386

The library subscribes to standard core collections of Computer Science and Information Technology databases and books by professional associations and publishers for example, ACM Digital Library, Synthesis Digital Library, Books24X7, Science Direct, Springer Link, Ebrary, and other databases found at this link: http://library.rit.edu/dbfinder/index.php?query=*%3A*&fq[1]=subject:%22Computer+Science+%26+F+Information+Technology%22

There is a strong collection of both print and e-books on this topic particularly if one uses the terms mobile apps, IOS programming, Android programming and related terms when searching the RIT Libraries Catalog via http://albert.rit.edu/

The Wallace library is a member of the Rochester Regional Library Council (RRLC), which provides RIT students, researchers, and faculty access to materials at other Monroe County libraries, using free RRLC Library access cards. Requested journal articles and books not owned by the Wallace Library will be obtained on a timely basis through the library’s Interlibrary loan and document delivery services (IDS) and ConnectNY.
October 31, 2014

Mr. David Lawrence, Faculty  
NTID Information & Computing Studies

Dear Dave,

The AAS degree proposal for Mobile App Development would be very efficiently served by Access Services. As you know, Writing courses are normally taught by NTID faculty without use of access services. The remaining credits of ‘perspectives courses’ would be require little additional resources to support because these classes are heavily enrolled by deaf students already. Added students would most often be served within existing supported sections of these lower division classes. Lower division courses are generally larger and hold higher numbers of deaf students, making them a relatively good bargain for service efficiency.

The perspective courses students take would apply within the proposed ASS degree and fill requirements for those students who move on to BS level programs at RIT. With increasing enrollments in RIT sections DAS, will see a small increase in resource requirements but this is impossible to quantify. We have been seeing slow, consistent growth over our entire history mapped to the increasing success of NTID-supported students in RIT majors. This proposal would fit comfortably within that trend.

We certainly support increased opportunities for deaf students to undertake studies in new areas, especially when the curriculum design does not place extraordinary burdens on Access Services. Having deaf students in NTID programs become acquainted with requesting and effectively using access services while in their AAS program seems a great way to prepare them for higher levels of study at RIT should they choose to pursue that option. Access Services is in support of your proposal.

Steve Nelson

Stephen A. Nelson  
Director of Operations, Access Services  
National Technical Institute for the Deaf

Rochester Institute of Technology  
(585) 475-6455 (office)  
(585) 797-4007 (cell)  
Steve.Nelson@rit.edu

XC: Dr. Richard Peterson, Assistant Dean and Director  
Ms. Elissa Olsen, Information & Computing Studies Chair
November 17, 2014

Dr. Dawn Hollenbeck  
Associate Professor and Chair  
Inter-College Curriculum Committee  
College of Science

Dear Dr. Hollenbeck,

I write in support of the proposal for an Associate of Applied Science (AAS) degree in Mobile Applications Development (MAD) submitted by the National Technical Institute for the Deaf (NTID).

As the degree proposal has developed, the program development team at NTID has kept us abreast of the general education demands that the AAS will bring to bear on the College of Liberal Arts. Having reviewed the cost model, I am comfortable supporting this curricular opportunity and initiative created by our colleagues in NTID.

The Dean's Office in the College of Liberal Arts is supporting this proposal with the understanding that the incremental resources associated with the liberal arts general education requirements of the degree will be allocated to the operating budget of the College of Liberal Arts.

Sincerely,

[Signature]

James J. Winebrake, Ph.D.  
Dean

cc: Gerard Buckley, President of NTID
Appendix D – Program Need and Marketability

A. Program Demand and Fit with Student Skills

Due to the explosive growth in the use of mobile devices to access and use the Internet, there’s been a boom in the field of mobile application (app) development. In 2012, deployment and use of mobile applications created a $53 billion economy and by 2016, it is expected to rise to $143 billion. Additionally, by 2016, the global app economy is expected to account for 33% of the combined app services and handset market (up from 18% in 2012) which is an indication that the number of apps will continue to grow and outpace the value of handsets on a yearly basis.

As smart phones, smart things, tablets and wearable devices continue to change the way we communicate, do business and access news & entertainment, the demand for new and innovative mobile apps is growing at an incredible speed. This increased demand translates to one of the largest IT skills gaps ever realized – there are simply more mobile app development job openings than skilled application developers to fill them.

According to an article published by the Online Learning Consortium, “Mobile Apps are the fastest growing dimension of the mobile space in higher education right now, with impacts on virtually every aspect of informal life, and increasingly, every discipline in the university.”

For two years, the ICS department in NTID has been offering a special topics course called “Windows Phone App Development”. Each time the course has been offered, we have achieved maximum class enrollment. Most of the students taking the course are either currently or formerly in one of ICS’ associate degree programs.

In the spring of 2014, the ICS department conducted a one-question clipboard survey for all students in the ICS department to gauge student interest in a program focusing on mobile app development. The question posed was, “If a program that teaches how to create apps on mobile devices (smartphones, tablets, etc.) were offered when you came to NTID, would you have considered applying to this program?” The results were profound. Of 51 respondents, 45 answered “Yes”.

Based on the app development course we offered, the student survey we conducted, program awareness through potential HS dual credit offerings and the natural affinity young people have for mobile devices, we anticipate this will be a popular program and one in which students can succeed.

B. RIT Rationale for the Program

RIT values NTID students and looks to them to make unique and innovative contributions to RIT’s academic community. President Destler, in his 2009 Address to the Institute, states that “NTID is one of the crown jewels of RIT, and we must do all we

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can to take advantage of opportunities that the presence of this college on our campus provides”.

From the RIT Strategic plan and its mission statement: “Our mission is to provide technology-based education tracks for personal and professional development. We rigorously pursue new and emerging career areas. We develop and deliver curricula and advance scholarship relevant to emerging technologies and social conditions.” This program addresses the new and rapidly growing market of mobile application development and use.

C. Graduate Marketability
ITCareerFinder, an on-line portal for helping IT professionals advance their careers, assembled a comparison of the decade’s hottest technology careers. These careers will experience the fastest growth through 2020, pay salaries well above the national average, boast top employment, and offer a range of advancement opportunities. The Mobile Application Developer position was highlighted as being the best computer career for the future. The Bureau of Labor Statistics predicts that the number of Computer Software Programmer jobs will grow by 28% (much faster than average) from 2010 to 2020 and that mobile app developers will have approximately 82,000 jobs for associate degree holders during that period.

In a letter from John Macko, Director of the NTID Center on Employment, he says “With the ever changing nature of the technology world, it is important that NTID Technical programs keep pace with what employers are seeking in skill level of college graduates. The Mobile Design and Development program will enhance NCE’s opportunity to attract employers seeking our students and graduates for both co-op and full-time positions.”

D. Input by External Partners
In September, 2014 the ICS department assembled a Curriculum Advisory Board to review the proposed Mobile App Development program. This board was comprised of nine representatives from the mobile computing Industry, three individuals from RIT BS level programs with strong knowledge of mobile app development, two from an out-of-state community college with a degree program in mobile app development and an NTID employment advisor.

The members of the Curriculum Advisory Board are shown below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Craig Lamb</td>
<td>Partner and CIO</td>
<td>Envative</td>
</tr>
<tr>
<td>David Mastrella</td>
<td>Partner and Chief Architect</td>
<td>Envative</td>
</tr>
<tr>
<td>Todd Bernhard</td>
<td>CEO</td>
<td>No Tie Software</td>
</tr>
<tr>
<td>Steve Maier</td>
<td>Senior Technical Evangelist</td>
<td>Microsoft</td>
</tr>
<tr>
<td>Ian Caspersson</td>
<td>President</td>
<td>IC9 Design</td>
</tr>
<tr>
<td>Mark Navarra</td>
<td>Recruiting Manager</td>
<td>Wellington Steele and Associates</td>
</tr>
<tr>
<td>R. John Gaudu</td>
<td>VP and Founding Partner</td>
<td>Wellington Steele and Associates</td>
</tr>
<tr>
<td>Paul Solt</td>
<td>CEO</td>
<td>Artwork Evolution</td>
</tr>
</tbody>
</table>

In the meeting, we reviewed our planned program curriculum and courses in detail. Feedback varied based on the needs represented by that advisor, but in general their feedback was helpful and resulted in some changes to the curriculum.

Based on their feedback, removed a second Web course we had planned in the second semester of the first year. Most of the members felt that we were overstretching the scope of the program as it related to web. Several of the advisory board members expressed the need for good fundamentals in programming for employers and this sparked the creation of a new course called Software Analysis and Design. This course will focus on refining and strengthening the fundamentals of programming that will lead to a greater understanding of app development.

Other feedback caused us to tweak some course content, but not change the course itself.

There were other feedback that we gathered where one advisory board member wanted to see more programming and another wanted to see more mobile web. Some of them admitted that they had the ideal candidate in mind, but that it would only fit into their business model. Rather than modifying the program to be address a specific niche in the field, we decided to keep the program’s goal of developing a broad set of skills that will easily adapt into various niches in the app development industry. One board member stated, “I would hire somebody out of this curriculum without thought actually if the person could come and present themselves with good communications skills and had some examples of work they have done. This is actually the type of person we’re looking for that’s -- I’m looking for more of a well-rounded person than an expert in one area. This curriculum actually excites me, what you're doing here.”

**The qualifications of the Advisory Board members**

**Todd Bernhard.**
CEO
No Tie Software - NoTie.NET.
Mr. Bernhard is an award-winning, bestselling App Developer specializing in accessibility apps including AllAccess.US, AutoVerbal and AutoRingtone. He is cofounder of AppRochester.com, AllAccess.US, and FlixAcademy.com and Contributing Editor for iPhone Life Magazine.
Jesse Black
Graduate of RIT’s CS department. Currently self-employed as a software development consultant with expertise in web applications and iOS and Android mobile application development

Daniel Bogaard
Associate Professor
Undergraduate Program Coordinator
Information Sciences and Technologies Department
Golisano College of Computing and Information Sciences
Grants:
The Emergency Services Directory of STEP, $127,500
NTHi Immunity in Young Children, Rochester General Hospital Health Systems, $16,059
Acute Otitis Media Database Project, Rochester General Hospital, $18,000
Speech to Text Systems: Comparative Analysis of Text Generation and Display Methods, NSF Award, $269,542.
Awards: Eisenhart Outstanding Teaching Award, Rochester Institute of Technology, 2012

Ian Caspersson
President
IC9design, Inc.
IC9design is a creative and technical web services company. We focus on developing web technologies into business solutions. Our business is in a constant state of evolution due to the ever evolving advancements in how people interact with devices, manipulate open-source software, and fine tune their virtual environments to fit their personal needs.

Bryan French
Lecturer
Department of Information Sciences and Technologies
Golisano College of Computing and Information Sciences
Rochester Institute of Technology
I teach Web and mobile app design and development as well as do mobile app development for myself and other companies.

R. John Gaudu
Vice President and Founding Partner
Wellington Steele & Associates, Inc.
Life-Long Learner with an Entrepreneurial Spirit. My 25+ year career has granted me the opportunity to understand the needs and requirements in both the public and private sectors of the Information Technology arena. I place a premium on establishing long term, trusted and mutually beneficial partnerships. These partnerships have afforded me the experience and insight necessary to deploy comprehensive and cost effective IT and human resource solutions for my clients. I have been fortunate enough to have led highly skilled teams from the concept & design phase through deployment and into ongoing support. Recently the bulk of my work has involved extensive outsource support for Application Development, Database Administration and Project Management for a wide variety of "Big Data" and "Cloud" solutions.
Specialties: My expertise is the design of complex infrastructure solutions. I have acquired detailed knowledge of both wired and wireless infrastructures, data center design, VoIP integration, application development with ongoing human resource support for the same.

Sharon Hoover  
Instructor of Computer Science  
Programs Coordinator, CSIS Department  
Stark State College, North Canton, Ohio  
Sharon Hoover is an Instructor of Computer Science at Stark State College. She has been employed with Stark State since 2011 and teaches a range of programming courses. Her most recent assignments have included technologies and programming languages such as Java, SQL Server, Android development and C# for Windows Phone. Prior to joining Stark State, she worked as a Software Developer/Analyst for 10+ years in the fields of healthcare and court case management.

Anthony Jefferson  
Senior Lecturer  
Department of Interactive Games and Media  
Golisano College of Computing and Information Sciences  
Rochester Institute of Technology  
I have been teaching at RIT since 2003 in the web and mobile application areas.

Regina Kiperman-Kiselgof  
Senior Employment Advisor  
Center on Employment (NCE)  
NTID  
I assist deaf and hard of hearing students with their employment searches in fields such as Applied Computer Technology and Information Technology. I teach courses related to job search processes, help students develop their interviewing skills, advise them about employment trends and coach them on finding co-op/internship opportunities. I develop and enhance employment opportunities for deaf and hard-of-hearing students and graduates of RIT. I travel a lot and conduct employer training workshop "Working Together: Deaf and Hearing People" regarding accommodations and integration in the workplace. I also work with the staff and faculty of the colleges and share job trends.

Craig Lamb  
Partner and Chief Information Officer  
Envative  
Craig is responsible for supporting current, and researching new technologies that are leveraged in the company’s custom development efforts. Envative is a development firm focusing on web-based and mobile solutions and technologies for business to business, and business to consumer opportunities. Solution sizes range from simple dynamic web applications to Enterprise, organizational-wide, applications. He was named chief information officer in January 2005 after serving as head developer for a number of years. As a result of Envative’s growth, the company was restructured and the chief information officer necessity emerged and Craig’s past experience made him an obvious choice for the position. Craig is also Envative’s mouthpiece and specializes in technical demonstrations including sales presentations and educational technical discussions. He earned his bachelor’s degree in Communications from St. John Fisher College and several Continued Education and Software Development Language certifications from RIT. Craig has worked on projects with British Telecom, Olympus, Leukemia & Lymphoma Society, The Andrew Mellon Foundation, Sirius Software, and Bagport Worldwide.
Steve Maier
Senior Technical Evangelist
Microsoft
We build experiences for your life
I have personally published 11 iOS apps, 2 Android apps, 11 Windows Phone apps, 6 Windows 8 apps and I have the ear of the Accessibility group at Microsoft for our operating systems and phones. This means that we have some great things to help people with disabilities.

David Mastrella
Partner and Chief Architect
Envative
David has been immersed Internet based application design & development for the past 13 years – with total development experience exceeding 20 years. He has held positions ranging from senior developer, systems manager, IT manager and technical consultant for a range of businesses across the country. David has been the integral in the growth of Envative as a partner and one of the chief architects of our antitexting mobile application; which is patent pending.
David’s strength comes from a deep knowledge of Internet technologies, design, project management skills and a rapid learning ability. He can communicate technical information effectively to non-technical people, and conversely translate ideas into both highly creative and efficient technical solutions.
David is responsible for all resource assignments and coordination of the engineers at Envative.
Dave holds a degree in Computer Science from Brockport University and an MBA from the Simon School.

Mark Navarra
Recruiting Manager
Wellington Steele & Associates, Inc.
Started in IT back in 1984 at Eastman Kodak as a VAX/VMS Systems Manager. He progressed up the IT infrastructure stack from a Novell Certified Network Engineer to a Microsoft Certified Systems Engineer.
As an IT consultant, Mark has worked for clients from NYC to North Carolina. He began working in IT Staffing in 2000 and continues to this day as the Recruiting Manager for Wellington Steele and Associates in Rochester. His background in IT gives him a unique perspective on the technical as well as the business side of IT Consulting.

Paul Solt
CEO
Artwork Evolution
We are a creative development studio that builds iPhone apps and teaches our secrets through online iPhone app programming and design courses.

Dr. Larry Ray
Associate Professor and Department Chair of Computer Science and Information Systems
Stark State College, North Canton, Ohio
Dr. Ray has been employed with Stark State College since 2000, after spending close to 20 years in the computer industry at various organizations. Stark State College is a comprehensive community college with transferable higher education and career development programs. The College offers more than 230 associate degrees, options, one-year and career enhancement certificates in business and entrepreneurial studies, education,
engineering technologies, health and human services, information technologies, liberal arts, mathematics and sciences. Stark State College has around 15,000 students enrolled that are seeking degrees, certificates, or professional development.
E. External Letters of Support

Steve Maier, Senior Tech Evangelist  
Microsoft Corp.
Ian Caspersson, President  
IC9 Design, Inc.
Mark Navarra, Recruiting Manager  
Wellington Steele & Associates, Inc.
R. John Gaudu, Vice President  
Wellington Steele & Associates, Inc.
Craig Lamb, Partner and CIO  
Envative
Dear David Lawrence:

I am happy to be a part of the advisory board for the new Mobile App Design and Development degree that is being planned. Microsoft likes to work with schools on new degrees like this to help give their feedback and share what we look for in the industry and what we have available.

I think that you have planned out has been well thought out and fits well into the market today and in the future. More and more apps are moving in a cross platform direction and introducing the students to this in the degree will definitely benefit them. This way a student could focus on a single platform later or be useful for any platform.

I like your plans to use Xamarin and C# as the method of delivering this content to the students. I have contacted the Vice President of Xamarin, Joseph Hill, and he is willing to work with the school and the instructors on the use of their software. I will try to introduce the people from this degree program to Joseph at the Evolve 2014 conference next week.

I also have been using Xamarin tools for about 5 years and will volunteer to help train and be an industry resource for the faculty to learn the tools and become proficient with them. I am on campus teaching in the Interactive Gaming and Media department three days a week and would not mind helping to go over all of the tools and how to use them.

I am also going to look to get the program some Windows Phones for the students to use. Microsoft donates things like this to schools all the time and I will work with our teams to get devices for this. We will do this closer to the launch of the program to get the latest phones for the students to use. I cannot speak for other phone developers, but I do know that Apple is getting more involved in education and might do the same right as the program starts.

Feel free to contact me for assistance with Xamarin or anything mobile as I also run the AppRochester mobile development community group. We are in our fourth year of existence and welcome new people.

Sincerely,

Steve Maier
steve.maier@microsoft.com
585-330-2598
Dear David,

Thank you for allowing me to be part of the Advisory Board for the planned Mobile App Design and Development program.

After reviewing the planned program mask, course descriptions and general plans for the program, I believe the plan is sound and will have a successful future for students interested in creating applications for mobile devices. The minor revisions to the program and courses that were recommended by the Advisory Board would make the program even stronger and we are hoping you will consider them.

I would be happy to consider a partnership with you so that faculty could come to our facility and experience what we do and how we do it. The capstone course you are planning is also an interesting concept and we would be willing to work with students on projects of interest to us to help them develop their skills. The app industry is ever-evolving and it is worth making note that you ensure the curriculum instruction adjusts as needed throughout the years to keep up with advancements in technology and web services.

If students complete your program with the skills intended, IC9design, Inc. would seriously consider co-op or full time employment for them.

Sincerely,

Ian Caspersson
President
IC9design, Inc.

office: 585.657.6379
toll free: 800.964.0299
website: http://www.ic9design.com

Real. Responsive. Websites. Learn More
From: Mark Navarra [mailto:mnavarra@wellingtonsteele.com]
Sent: Thursday, October 02, 2014 1:17 PM
To: David Lawrence
Subject: Wellington - MADD

David,
Just a quick note to say how valuable we think the MADD program could be for us as a recruiting agency.

RIT is one of the few colleges in the area that “grow” qualified software/mobile application developers/engineers and we would certainly recruit people from the MADD program.

Thank you

Mark J. Navarra
Recruiting Manager
Wellington Steele & Associates, Inc.
720 East Ave
Rochester, NY 14607
Office: 585-360-4350
Mobile: 585-905-8812
mnavarra@wellingtonsteele.com
Proud to be named a Rochester Top 100 Company for 2012 & 2013
OCTOBER 6, 2014

Hi David:

I just wanted to take a moment to say thank you for inviting Wellington Steele & Associates Inc. to take part in the curriculum review and planning session for your Mobility Applications Design and Development course. As a software development and outsource company here in town I can tell you our needs for these types of graduates has never been higher. Our placements in the App/Dev arena have double each year for the past three years we sincerely hope that the trend continues.

Keep up the great work. I hope to be placing these gifted young graduates with our clients and associates in the near future!

Regards,

R. John Gaudu

EVP, Wellington Steele & Associates, Inc.
Elissa Olsen  
Department Chair  
RIT/National Technical Institute for the Deaf  
52 Lomb Memorial Drive  
Rochester, NY 14623

Dear Elissa,
David and I wanted to take a moment to thank you for including us as members of the Advisory Board for the planned Mobile App Design and Development program.

We were both impressed with the diligence and considerations outlined in the planned program mask and course descriptions. We believe the program is sound and would be excited to participate in a CoOp program and eventually employ students from this program. The minor revisions to the program and courses that were recommended by the Advisory Board would make the program even stronger and we are hoping you will consider them. We would be happy to consider a partnership with you so that faculty could come to our facility and experience what we do and how we do it. The capstone course you are planning is also an interesting concept and we would be willing to work with students on projects of interest to us to help them develop their skills.

Again, David and I are honored to be included in this important program.

Sincerely,

Craig Lamb  
Partner  

Cc: DMM
Appendix E – Space Allocation/Renovation Request

Space

With the additional 12 students per year, and the addition of 11 new technical courses to the ICS portfolio of courses, lecture and lab space will be impacted. There is a pending 2015 move of the ICS department from HLC building to the LBJ building. In the most recent design there is an (approximate) 450 sq. ft. lab designated for the Mobile Application Development lab if the program is approved. Before the Mobile Application Development program is implemented (or in the case the program is not approved), the lab will be used for the ACT Technical Capstone course.

The lab will be equipped with sufficient benches, electrical capacity, internet connections, and computers for use as either the capstone lab or the Mobile Application Development lab.

Two classrooms are part of the space designs for the ICS department in LBJ. In addition, there are other classrooms throughout LBJ that can be used if needed. These classrooms, along with the available lab space will be sufficient to meet the needs of our current programs and this Mobile Application Development program.

See the note from Erwin Smith, NTID Assistant Vice President for Information Technology and College Operations dated 10/24/14 on the next page.
Ms. Elissa Olsen,

NTID is renovating nearly 9,000 sq. ft. in LBJ Hall to support the Information Computing Studies programs. Approximately 450 sq. ft. on the 1st floor of LBJ Hall will be allocated to the proposed Mobile Application Device (MAD) program. NTID is working with FMS and HBT Architects to finalize the design and construction schedule. Construction is planned to begin in December 2014 and expected to be completed by mid-summer 2015, in time to support classes for the Fall 2015 semester.

If additional information is required, please don't hesitate to contact me.

Sincerely,

Erwin J. Smith
Assistant Vice President, Information Technology and College Operations
National Technical Institute for the Deaf
Rochester Institute of Technology
Lyndon Baines Johnson Bldg. 60-2631
52 Lomb Memorial Drive
Rochester, NY 14623-5604

Phone: 585.475.6224 (V/TTY)
Fax: 585.475.7410
Email: erwin.smith@rit.edu

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Appendix F – Faculty Curricula Vitae

The following pages contain the Curricula Vitae for the following faculty:

Elissa Olsen
Karen Beiter
Chris Campbell
Raja Kushalnagar
Joseph Stanislow
Brian Trager
Curriculum Vitae

Elissa M. Olsen

Rochester Institute of Technology
National Technical Institute for the Deaf
Information and Computing Studies Department
96 Lomb Memorial Drive
Rochester, NY 14623
Elissa.Olsen@rit.edu - 585-286-4639

Formal Education

M.S., Software Development and Management, Rochester Institute of Technology 1999
B.S., Computer Systems, Rochester Institute of Technology 1980
A.A.S., Data Processing, National Technical Institute for the Deaf 1978

Professional Employment History

1993-Present
Rochester Institute of Technology
National Technical Institute for the Deaf
Rochester, NY 14623
Administrative Chairperson: Manager of an academic department consisting of fourteen full-time faculty and two staff positions. Department student enrollment is approximately 150. Responsible for coordinating all academic matters including instruction, advising, scheduling, curriculum, student records, student admissions and academic actions. Also responsible for maintaining the department budget, monitoring the plan of work (POWs) and appraisals for all department faculty/staff, and managing the department facilities and inventory control of hardware and software.

1993-2002
Teaching Faculty: Teach and develop a variety of courses offered by Applied Computer Technology department. Courses include: Logic and Problem Solving, Introduction to Business Programming, Application Software, PC Hardware I, PC Hardware II, Spreadsheet Software, Career Exploration in Applied Computer Technology, Employment Seminar, Internet Technologies, World of Work, etc.

1998-2002
Department Coordinator: Assisted department chair with various departmental tasks, including evaluating student coop experience and assigning final grades, performing degree audit certifications for students graduating each term and representing the department during the absence of the chairperson at center meetings and numerous other requests made by the chairperson.

1980-1993
Electronic Data System
1000 Lexington Avenue
Rochester, NY 14606
Systems Programmer: Supported AC Rochester Materials Management Systems division. Maintained the Production, Scheduling, Inventory and
Control (PSIC) computer system. Performed current situation analysis, construction, unit testing, implementation and production support. Work responsibilities included:

- Implementing Electronic Data Interchange (EDI) capability for data transmission to other sites. Standardized deliverables, performed work analysis using data modeling techniques.
- Constructing unit testing and implemented the engineering systems in Burroughs operating environment.
- Coordinating the automated disaster recovery plan using the Data Management System utilities and executed the simulation of recovering plan for the system’s 1,800 jobs.
- Assisting with the implementation of the system by installing interface programs to extract data from Xerox Sigma 9 system to IBM environment. Performed estimates, analysis, definition, design, construction, testing and implementation of various phases of manufacturing and financial programs.

Tenure and Promotion

Awarded Tenure, National Technical Institute for the Deaf at Rochester Institute of Technology, 2003-2004 academic year

Promoted to Assistant Professor, National Technical Institute for the Deaf at Rochester Institute of Technology, 2001-2002 academic year

Teaching and Professional Certifications

Sign Language Proficiency Interview (SLPI): Advanced Plus to Superior Plus

Scholarship and Related Activities


Institute Committee served (selected):

- Sign Language Proficiency Interview (SLPI) team member (interviewer and rater)
- Academic Integrity Committee representative
- NTID Curriculum Committee
- Tenure Committee
- Promotion Committee
- The Edmund Lyon Memorial Lectureship
- Alpha Sigma Theta Sorority Advisor
- RIT's Distinguished Alumni Award Selection Committee
- Instructional Technology Consortium Committee
- NTID’s Outstanding Scholarship Committee
- Computerized Early Alert System
Karen J. Beiter
Rochester Institute of Technology
National Technical Institute for the Deaf
Information and Computing Studies Department
96 Lomb Memorial Drive
Rochester, NY 14623-5604
(585) 286-4546 • Karen.Beiter@rit.edu

Education

M.S., Computer Science, Rochester Institute of Technology 1994
B.S., Computer Science, Rochester Institute of Technology 1988

Career: Teaching

Program Coordinator Rochester Institute of Technology, Rochester, NY 2011- now
Assistant Professor Rochester Institute of Technology, Rochester, NY 2003- now
Instructor Rochester Institute of Technology, Rochester, NY 2001-2003
Visiting Instructor Rochester Institute of Technology, Rochester, NY 1998-2001
Adjunct Instructor Rochester Institute of Technology, Rochester, NY 1993-1998

Career: Industrial Experience


Teaching/Tutoring Experience

Teaching:
NCAR 100 – Freshman Seminar
NACT 120 – Intro to Computer Applications
NACT 230 – Intro to Programming
0805-201 – Applications Software
0805-205 – Intro to Midrange Computer Operations
0805-206 – Command Language/Utilities for Midrange Computers
0805-207 – Multiprogramming & Spooling for Midrange Computers
0805-211 – Web Development for Business
0805-218 – PC Operating Systems
0805-220 – Intro to UNIX (for AS students)
0805-220 – Intro to UNIX (for AOS/AAS students)
0805-230 – Intro to Programming (formerly Programming I)
0805-231 – Programming II
0805-251 – Intro to Web Development (formerly Web Development I)
0805-252 – Web Applications (formerly Web Development II)
0805-305 – Spreadsheet Software
0805-310 – Microcomputer Database
0805-320 – Client Side Scripting
0805-323 – Advanced Web Development
0805-340 – Visual Programming Language I
0805-341 – Visual Programming Language II
0805-398 – Special Topics: Intro to Multimedia Using Flash
0805-398 – Introduction to Linux
0805-398 – Introduction to JavaScript
0805-398 – PHP Programming
0806-201 – Employment Seminar

Teaching Support:
CSCI 141 – Computer Science I
ISTE 120 – Computational Problem Solving in the Information Domain I
ISTE 121 – Computational Problem Solving in the Information Domain II
ISTE 230 – Intro to Database & Data Modeling
ISTE 608 – DB Design & Implementation
MAAT 306 – Cross Medial Publishing
MGIS 350 – Developing Business Applications
MGIS 320 – Database Management Systems
PHPS 315 – Web Publishing
VCDE 723 – Interaction Design
4002-217 – Programming for Info Tech I
4002-218 – Programming for Info Tech II
4002-219 – Programming for Info Tech III
4002-206 – Web Foundations
4002-320 – Intro to Multimedia
4002-360 – Intro to Dbase and Data Modeling
0806-101 – Job Search

Project Fast Forward Dual Credit Consultant Teaching:
0805-201 – Applications Software
0805-251 – Intro to Web Development
(Visited several schools across the USA to meet with high school instructors and students)

Summer Youth Camps:
Explore Your Future – Discovering your areas of technical skills using LEGO robotics
TechGirlz/TechBoyz – Build Your Own PC, Web Development, Movie Maker
DRobotz – Enriching your math skills with LEGO Robotics and Programming
Summer Vestibule Program – Sampling careers for incoming freshmen

Curriculum Development  

New Semester Courses:
NACT-120 – Computer Applications
NACT-170 – Intro to Web Development

New Special Topics Courses:
0805-398 – Introduction to Linux
0805-398 – Introduction to JavaScript
0805-398 – PHP Programming
0805-398 – Intro to Multimedia Using Flash

Program Coordinator Experience  

Administrative Tasks:
Chaired the curriculum development conversion from the quarter to semester system
Managed the student coop program
Scheduled quarterly and semester courses
Assigned faculty courses/workloads
Chaired search committees
Coordinated the Summer Vestibule Program
Organized department level student meetings
Helped manage the Program Outcomes Assessment
Hired and scheduled Peer Tutors
Updated the ICS department handbook
Wrote letters of recommendations for scholarships and job positions
Led several prospective student tours

Research Experience  

Refereed Proceedings:
1. Kushalnagar, R. S., Trager, B. P., and Beiter, K. B., Accessible Viewing Device.


Presentations


Workshops Presented

(Deaf Initiative in Technology Week-long Workshops)


2. Beiter, K. B., Olsen, E. M., and Lange, D. A., Intro to LibreOffice, Max Factor Grant and NTID (DIIT), held in Los Angeles, CA (2012, March)


5. Beiter, K. B., Olsen, E. M., and Lange, D. A., Adobe Flash CS4, Max Factor Grant and NTID (DIIT), held in Los Angeles, CA (2010, March)
6. BEITER, K. B., OLSEN, E. M., AND LANGE, D. A., Creating Websites with XHTML & Adobe Dreamweaver CS4, Max Factor Grant and NTID (DIIT), held in Los Angeles, CA (2009, March)


8. BEITER, K. B. AND OLSEN, E. M., Microsoft PowerPoint, NTID (DIIT), held in University High School, Irvine, CA (2006, March)


10. BEITER, K. B., Introduction to JavaScript, NTID (DIIT), held at National Technical Institute for the Deaf, Rochester, NY (2005, June)


13. BEITER, K. B., Introduction to Microsoft PowerPoint, NTID (DIIT), held at St. Mary’s School for the Deaf, Buffalo, NY (2004, December)


15. BEITER, K. B., Introduction to JavaScript, NTID (DIIT), held at National Technical Institute for the Deaf, Rochester, NY (2003, February)

(One-Day Workshops)


Major Contributions to the Institute

Curriculum Related
1. NTID Student Rating System Committee 2009- now
2. NTID Curriculum Committee 2005-2009
3. TechGirlz Implementation Committee 2005-2006
4. Academic Potential Committee: Digital Arts Competition 2005
5. Chair/Peer Observation Project Tool (GCOT) 2003-2005

Major Contributions to the Community

1. Rochester Deaf Rotary (Founding Member, President Elect, Vice-President, President, Past-President) 2006- now
2. Rochester Lutheran Campus Ministry (Treasurer, Board Officer) 2008- now
3. Deaf Women of Rochester (Treasurer) 2004-2006
5. International Lutheran Deaf Association 2009 Conference (Co-Chairperson) 2005-2010
6. Alpha Lutheran Church of the Deaf (Treasurer, Secretary) 1990- now

Professional Memberships

ACM/SIGCSE (Association for Computing Machinery, Special Interest Group on Computer Science Education)

Certifications


Awards/Honors

Rotary’s Paul Harris Fellowship Award, June 2004 (Award for helping found the world’s first and only Rochester Rotary Club for the Deaf)

Last Updated: May 29, 2014
Chris Campbell
Rochester Institute of Technology
National Technical Institute for the Deaf
Information and Computing Studies Department
96 Lomb Memorial Drive
Rochester, NY 14623
585-286-4079 • cmcdas@rit.edu

Education

M.S., Computer Information Systems, University of Phoenix  2000
B.S., Business Management, Rochester Institute of Technology  1996

Career: Teaching

Instructor  Rochester Institute of Technology, Rochester, NY  2012-now

Career: Professional Experience

Application/Business Analyst  NTID, Department of Access Services  Rochester, NY  2010-2012
Senior Software Developer  Apollo Group, Inc., Human Resources  Phoenix, AZ  2004-2010
Software Developer II  Apollo Group, Inc., Information Technology  Phoenix, AZ  2000-2004
Software Developer I  Apollo Group, Inc., Information Technology  Phoenix, AZ  1999-2000
Webmaster  University of Phoenix, University Services  Phoenix, AZ  1997-1999

Teaching/Tutoring Experience

Teaching:
0805-201 – Applications Software
0805-230 – Intro to Programming
0805-251 – Intro to Web Development
0805-310 – Microcomputer Database Software
NACA-160 – Programming Fundamentals I
NACA-172 – Website Development
NACT-170 – Intro to Web Development
NACT-230 – Intro to Programming
NACT-235 – Intro to Database Applications
NCAR-100 – Freshman Seminar

*Summer Youth Camps:*
TechGirlz – Build Your Own PC
Summer Vestibule Program – Sampling careers for incoming freshmen

**Curriculum Development**

**New Semester Courses:**
NACT-170 – Introduction to Web Development
NACT-230 – Introduction to Programming
NACT-235 – Introduction to Database Applications

**Workshops Presented**


**Major Contributions to the Institute**

6. NTID Committee for Sustainable Practices (chairperson) 2011-2012
7. NTID Committee for Faculty/Staff Sign Language Communication Expectations 2011-2012
8. Program Development Committee – Mobile Application Development 2013-now

**Major Contributions to the Community**

7. Rochester School for the Deaf Parent Staff Association (Secretary) 2013-2014
8. Rochester School for the Deaf Parent Staff Association (President) 2014-now

**Certifications**


Last Updated: October 21, 2014
Raja S. Kushalnagar, J.D., LL.M., Ph.D.
Rochester Institute of Technology
GOL-1517, 96 Lomb Memorial Drive
Rochester, NY 14623-5604, USA
(585) 643-6773
rskics@rit.edu
www.cs.rit.edu/~rskics/

Career

Assistant Professor, Information and Computing Studies ……………… 2011-Now
Rochester Institute of Technology, Rochester, NY

Instructor, Information and Computing Studies ……………………………. 2010-2011
Rochester Institute of Technology, Rochester, NY

Teaching Assistant, Summer Academy for Deaf and Hard of Hearing ……… 2007
University of Washington, Seattle, WA

Information Protection Manager, Information Technology Services ……… 2000-2002
Gallaudet University, Washington DC

Member of Technical Staff I, Bell Laboratories ……………………………… 1997-2000
Bell Labs at Lucent Technologies, Naperville, IL

Education

Ph.D., Computer Science, University of Houston …………………… December 2010
Dissertation: Optimizing Video Presentations for Deaf Students in mainstream classrooms.

LL.M., Intellectual Property and Information Law, University of Houston …… May 2010
Paper: Balancing Perceptually Disabled Consumers’ Rights Against Copyright Holders’ Rights.
Advisor: Greg Vetter, Esq.

J.D., cum laude, Thurgood Marshall School of Law, Texas Southern University …… May 2008
Advisor: Okezie Chukwumerije, Esq.

M.S., Computer Science, Rochester Institute of Technology …………………. August 1999
Advisor: Dr. Peter G. Anderson

B.S., Applied Physics, Angelo State University ……………………………. August 1994
Advisor: Dr. H. Ray Dawson

Research Goals

Modern software user interfaces increasingly mirror physical and social interaction, as this leverages existing human interactive knowledge. However, the range and experience of this interaction, such as gesture and speech is incredibly diverse and can be a barrier for users with different abilities and cultures. My research aim is to develop efficient multi-modal interfaces for more inclusive and effective software for users with different abilities and backgrounds.
## Teaching Experience

### Teaching: Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC.08</td>
<td>NACA-160 - Programming Fundamentals I</td>
<td>Spring 2014</td>
</tr>
<tr>
<td>TC.07</td>
<td>NACT-250 - Computer and Data Security</td>
<td>Fall 2013</td>
</tr>
<tr>
<td>TC.06</td>
<td>0805-353 - Computer Forensics</td>
<td>Winter 2012</td>
</tr>
<tr>
<td>TC.05</td>
<td>0805-390 - Programming Fundamentals</td>
<td>Spring 2012</td>
</tr>
<tr>
<td>TC.04</td>
<td>0805-353 - Computer Forensics</td>
<td>Winter 2011</td>
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<tr>
<td>TC.03</td>
<td>0805-390 - Programming Fundamentals</td>
<td>Fall 2011</td>
</tr>
<tr>
<td>TC.02</td>
<td>0805-390 - Programming Fundamentals</td>
<td>Spring 2011</td>
</tr>
<tr>
<td>TC.01</td>
<td>0805-390 - Programming Fundamentals</td>
<td>Fall 2010</td>
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</table>

### Teaching: Support

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Term</th>
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<tbody>
<tr>
<td>TS.44</td>
<td>CSCI-141 - Computer Science I</td>
<td>Spring 2014</td>
</tr>
<tr>
<td>TS.43</td>
<td>CSCI-142 - Computer Science II</td>
<td>Fall 2013</td>
</tr>
<tr>
<td>TS.42</td>
<td>CSCI-251 - Concepts of Parallel and Distributed Systems</td>
<td>Fall 2013</td>
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<tr>
<td>TS.41</td>
<td>ISTE-100 - Computing and Problem Solving I (C++)</td>
<td>Spring 2014</td>
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<tr>
<td>TS.40</td>
<td>ISTE-100 - Computing and Problem Solving II (C++)</td>
<td>Spring 2014</td>
</tr>
<tr>
<td>TS.39</td>
<td>ISTE-121 - Computing and Problem Solving II (Java)</td>
<td>Spring 2014</td>
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<tr>
<td>TS.38</td>
<td>CSCI-101 - Principles of Computing</td>
<td>Fall 2013</td>
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<tr>
<td>TS.37</td>
<td>CSCI-141 - Computer Science I</td>
<td>Fall 2013</td>
</tr>
<tr>
<td>TS.36</td>
<td>CSCI-142 - Computer Science II</td>
<td>Fall 2013</td>
</tr>
<tr>
<td>TS.35</td>
<td>CSCI-242 - Computer Science for Transfers</td>
<td>Fall 2013</td>
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<tr>
<td>TS.34</td>
<td>CSCI-243 - Mechanics of Programming</td>
<td>Fall 2013</td>
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<tr>
<td>TS.33</td>
<td>CSCI-251 - Concepts of Parallel and Distributed Systems</td>
<td>Fall 2013</td>
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<tr>
<td>TS.32</td>
<td>CSCI-261 - Analysis of Programming</td>
<td>Fall 2013</td>
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<tr>
<td>TS.31</td>
<td>4050-302 - Scripting In Perl</td>
<td>Fall 2013</td>
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<tr>
<td>TS.30</td>
<td>4002-217 - Programming for Info Tech I</td>
<td>2012-2013</td>
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<td>TS.29</td>
<td>4002-218 - Programming for Info Tech II</td>
<td>2012-2013</td>
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<td>TS.28</td>
<td>4002-219 - Programming for Info Tech III</td>
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<td>TS.27</td>
<td>4003-241 - Problem-based Intro Cs</td>
<td>2012-2013</td>
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<td>TS.26</td>
<td>4002-320 - Introduction to Multimedia</td>
<td>2012-2013</td>
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<td>TS.25</td>
<td>4002-242 - Data Struct Prob Solve</td>
<td>2012-2013</td>
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<td>TS.24</td>
<td>4002-243 - O-O Programming</td>
<td>2012-2013</td>
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<td>TS.23</td>
<td>4002-206 - Web Foundations</td>
<td>2012-2013</td>
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<tr>
<td>TS.22</td>
<td>4002-208 - Intro To Programming</td>
<td>2012-2013</td>
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<td>TS.21</td>
<td>4002-210 - Programming With Classes</td>
<td>2012-2013</td>
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<tr>
<td>TS.20</td>
<td>4002-217 - Programming for Info Tech I</td>
<td>2011-2012</td>
</tr>
<tr>
<td>TS.19</td>
<td>4002-218 - Programming for Info Tech II</td>
<td>2011-2012</td>
</tr>
<tr>
<td>TS.18</td>
<td>4002-219 - Programming for Info Tech III</td>
<td>2011-2012</td>
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<tr>
<td>TS.17</td>
<td>4003-241 - Problem-based Intro Cs</td>
<td>2011-2012</td>
</tr>
<tr>
<td>TS.16</td>
<td>4002-320 - Introduction to Multimedia</td>
<td>2011-2012</td>
</tr>
<tr>
<td>TS.15</td>
<td>4002-242 - Data Struct Prob Solve</td>
<td>2011-2012</td>
</tr>
<tr>
<td>TS.14</td>
<td>4002-243 - O-O Programming</td>
<td>2011-2012</td>
</tr>
<tr>
<td>TS.12</td>
<td>4002-208 - Intro To Programming</td>
<td>2011-2012</td>
</tr>
</tbody>
</table>
TS.11 4002-210 - Programming With Classes       2011-2012
TS.10 4002-217 - Programming for Info Tech I      2010-2011
TS.09 4002-218 - Programming for Info Tech II     2010-2011
TS.08 4002-219 - Programming for Info Tech III    2010-2011
TS.07 4003-241 - Problem-based Intro Cs           2010-2011
TS.06 4002-320 - Introduction to Multimedia      2010-2011
TS.05 4002-242 - Data Struct Prob Solve           2010-2011
TS.04 4002-243 - O-O Programming                  2010-2011
TS.03 4002-206 - Web Foundations                  2010-2011
TS.02 4002-208 - Intro To Programming             2010-2011
TS.01 4002-210 - Programming With Classes        2010-2011

Teaching: Curriculum Development

TD.05 NACA-162 - Programming Fundamentals II      Fall 2013
TD.04 NACA-161 - Programming Fundamentals I       Spring 2012
TD.03 NACT-250 - Computer and Data Security       Spring 2012
TD.02 0805-398 - Windows Mobile Phones            Winter 2012
TD.01 0805-353 - Computer Forensics              Fall 2011

Teaching: Programs

TP.07 Summer Vestibule Program, National Technical Institute for the Deaf     Aug 19-25, 2014
TP.06 Stepping Stones to Success, National Technical Institute for the Deaf   Jul 26-27, 2014
TP.05 Stepping Stones to Success, National Technical Institute for the Deaf   Jul 25-27, 2013
TP.04 Summer Vestibule Program, National Technical Institute for the Deaf     Aug 19-25, 2013
TP.02 Summer Vestibule Program, National Technical Institute for the Deaf     Aug 22-29, 2011
TP.01 Summer Academy for Deaf and Hard of Hearing, U of Washington          June-Aug, 2007

Teaching Awards

TA.01 RIT Heavy Hitter for Most Active myCourses Course (Top 1.3%)       Spring 2014

Teaching and Professional Certifications

Teaching: Related Certifications

TPC.02 Sign Language Proficiency Interview (SLPI): Advanced Plus to Superior Plus 2013
TPC.01 Certified Information Systems Security Professional (CISSP)      2001
Research Experience

Peer-Refereed papers, published in Conference Proceedings¹


*W4A Best Technical Paper


¹Premier conferences in computer science and human-computer interaction (e.g., ASSETS, CSCW, CHI, IUI, UIST) are highly selective and intended for archival papers only. These conferences often exceed journals in their selectivity, visibility, and impact. Submissions undergo multiple rounds of review before being accepted for publication. Please see http://portal.acm.org/citation.cfm?id=1743546.1743569 (REF-1) for a study comparing the impact of conference papers and journals in these areas. When appropriate, the acceptance rate appears in brackets following each citation.


Peer-Refereed Journal Papers


Book Chapters


Peer-Refereed Conference Posters and Presentations

PPP.17 Thomas Ansill, Jaime Penzellna, Raja S. Kushalnagar, and Daniel Saavedra. Undergraduate Research in Mathematics with Deaf and Hard of Hearing Students, 2014
PPP.13 Raja S. Kushalnagar. ASL-STEM: Community Development of Signs for STEM. In International Pacific Rim Conference on Disabilities, Honolulu, HI, April 2013. International Pacific Rim Conference on Disabilities


PPP.02 Raja. S. Kushalnagar. Multiple Viewing Perspectives: Java Enabled Webcams. In Academic Conference Workshop, Houston, TX, April 2010


Published Working Papers


PWP.03


Invited Talks


PIT.07 Raja S. Kushalnagar. Graduate School STEM Programs: Important Factors to consider for Deaf and Hard of Hearing Students. In Summer Academy for Deaf and Hard of Hearing Students, Seattle, WA, July 2013


PIT.05 Raja S. Kushalnagar. Life as a Deaf Graduate Student in STEM before and after ADA. In Summer Academy for Deaf and Hard of Hearing Students, Seattle, WA, 2012

146
PIT.04 Raja S. Kushalnagar. Accessible Viewing for Deaf and Hard of Hearing Students. In Communications and Culture, Ryerson University, Toronto, ON, March 2012. Ryerson University

PIT.03 Raja S. Kushalnagar. Deaf and Hard of Hearing STEM Students in Graduate School. In Summer Academy for Deaf and Hard of Hearing Students, Seattle, WA, 2011


Invited Panels and Working Groups

PIP.04


Technology Demonstrations

PTD.06


PTD.02 Raja S. Kushalnagar and Brian P. Trager. Multiple Video Recordings: NTID Supported Classroom Recording Accessibility. In RIT Faculty Institute on Teaching and Learning Conference, Rochester, NY, May 2011

PTD.01 Brian P. Trager and Raja S. Kushalnagar. C2Learn. In RIT Faculty Institute on Teaching and Learning Conference, Rochester, NY, May 2011

Selected News Articles and Videos

PNV.05 RIT University News. Effective Assistive Technology, 2013. URL http://www.youtube.com/watch?v=22vi51MLhBE

PNV.04 James Goodman. RIT professor works to make technology more accessible, January 2013. URL http://www.democratandchronicle.com/article/20130120/NEWS01/301200045/RIT-professor-works-make-technology-more-accessible


## Supervised Student Research

*Deaf, Hearing; Current Job*

<table>
<thead>
<tr>
<th>Year</th>
<th>Student Name</th>
<th>Position Description</th>
<th>Semesters</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR.27</td>
<td>Daniel Steed</td>
<td>Research Assistant (Co-op) position: Develop features for Accessible Viewing Device software and hardware: interface with portable eye-trackers to support gaze controlled video, or interfaces with digital vibration devices to provide tactile feedback that is synchronized with captions</td>
<td>Summer 2014</td>
</tr>
<tr>
<td>SR.26</td>
<td>Vasu Gupta</td>
<td>Research Assistant (Co-op) position: Develop features for Accessible Viewing Device software and hardware: interface with portable eye-trackers to support gaze controlled video, or interfaces with digital vibration devices to provide tactile feedback that is synchronized with captions</td>
<td>Summer 2014</td>
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<tr>
<td>SR.25</td>
<td>John Rivera</td>
<td>Research Assistant (Co-op) position: Develop features for Accessible Viewing Device software and hardware: interface with portable eye-trackers to support gaze controlled video, or interfaces with digital vibration devices to provide tactile feedback that is synchronized with captions</td>
<td>Summer 2014</td>
</tr>
<tr>
<td>SR.24</td>
<td>Warrance Yu</td>
<td>Research Assistant (Co-op) position: Develop features for Accessible Viewing Device software and hardware: interface with portable eye-trackers to support gaze controlled video, or interfaces with digital vibration devices to provide tactile feedback that is synchronized with captions</td>
<td>Summer 2014</td>
</tr>
<tr>
<td>SR.23</td>
<td>Eric Epstein</td>
<td>Collaborative Captions Assistant: Recruit and run studies</td>
<td>Spring 2014</td>
</tr>
<tr>
<td>SR.22</td>
<td>Wander Bravo</td>
<td>Closed Cues Research Assistant: Develop interface for Closed Cues</td>
<td>Spring 2014</td>
</tr>
<tr>
<td>SR.21</td>
<td>Samuel Georgeo</td>
<td>Collaborative Captions Assistant: Develop caption interface features</td>
<td>2013 - 2014</td>
</tr>
<tr>
<td>SR.20</td>
<td>Vignesh Ramachandran</td>
<td>Collaborative Captions Assistant: Develop caption and tactile interface</td>
<td>2013 - 2014</td>
</tr>
<tr>
<td>SR.19</td>
<td>Joseph Vigilante</td>
<td>Accessible Viewing Device Research Assistant: Video Editor</td>
<td>2013 - 2014</td>
</tr>
<tr>
<td>SR.18</td>
<td>Emily Werfel</td>
<td>Research Study Assistant: Recruit and run Accessible Viewing Device studies</td>
<td>Fall 2013</td>
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<tr>
<td>SR.17</td>
<td>Yue Ding</td>
<td>Analysis of student eye movements while watching mainstreamed lectures</td>
<td>Fall 2013</td>
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<tr>
<td>SR.16</td>
<td>Youmee Lee, UX Designer</td>
<td>Accessible Viewing Device Research Assistant: Video Editor</td>
<td>Spring 2013</td>
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<tr>
<td>SR.15</td>
<td>Huipu Yu</td>
<td>Accessible Viewing Device Study Assistant: Recruit and run studies</td>
<td>Spring 2013</td>
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<tr>
<td>SR.14</td>
<td>Bradley Frank</td>
<td>Accessible Viewing Device Co-op Student: Develop caption features</td>
<td>Spring 2013</td>
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<tr>
<td>SR.13</td>
<td>Prerna Keshari</td>
<td>Accessible Viewing Device Research Assistant: Develop eye-tracking control</td>
<td>2012-2013</td>
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<tr>
<td>ID</td>
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<td>Position</td>
<td>Project</td>
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<tr>
<td>SR.12</td>
<td>Michelle Chung</td>
<td>ASL Avatars Study Assistant: Capture signs via Kinect</td>
<td>2012-2013</td>
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<tr>
<td>SR.11</td>
<td>Raghu Puppala</td>
<td>ASL Avatars Research Assistant: Develop algorithms to classify signs</td>
<td>2012-2013</td>
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<tr>
<td>SR.10</td>
<td>Melvin Wingfield</td>
<td>Collaborative Captioning: Analyze caption readability properties</td>
<td>2012-2013</td>
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<tr>
<td>SR.09</td>
<td>Kristin Parker</td>
<td>2) ASL-STEM Research Assistant: Contribute STEM signs</td>
<td>2012-2013</td>
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<td></td>
<td></td>
<td>1) Collaborative Captions Assistant: Run and analyze eye-tracking studies</td>
<td>Spring 2014</td>
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<tr>
<td>SR.08</td>
<td>Noella Kolash</td>
<td>2) Accessible Viewing Device (Co-op position): Develop replay features for AVD</td>
<td>2012-13</td>
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<td>1) Closed Cues Research Assistant: Develop interface for Closed Cues</td>
<td>Spring 2014</td>
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<tr>
<td>SR.07</td>
<td>Lalit Phadtare</td>
<td>ASL Avatar Research Assistant: Classify ASL handshapes via Kinect</td>
<td>2011-2012</td>
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<tr>
<td>SR.06</td>
<td>Sai Krishna Mulpuru</td>
<td>Multiple View Perspectives Assistant: Run eye-tracking studies</td>
<td>Fall and Winter 2012</td>
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<td></td>
<td>Graduate Student, Vanderbilt University, Nashville, TN</td>
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<tr>
<td>SR.05</td>
<td>Joel Skelton</td>
<td>Research Study Assistant: Run eye-tracking studies for Multiple View Perspectives project</td>
<td>Summer 2012</td>
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<tr>
<td></td>
<td></td>
<td>Research Study Assistant: Run studies for Multiple View Perspectives project</td>
<td>Summer 2012</td>
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<tr>
<td>SR.04</td>
<td>Joseph Dalpra</td>
<td>Study Assistant: Contribute STEM signs to ASL-STEM</td>
<td>Summer 2012</td>
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<tr>
<td>SR.03</td>
<td>Rachel Yerian</td>
<td>Research Assistant: Contribute STEM signs to ASL-STEM</td>
<td>Summer 2011</td>
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<tr>
<td>SR.02</td>
<td>Moges Gembero, Technician, Purple Communications, Rochester, NY</td>
<td>Research Assistant: Contribute STEM signs to ASL-STEM</td>
<td>Summer 2011</td>
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<tr>
<td>SR.01</td>
<td>Tri Ngo, Network Administrator, Google, Mountain View, CA</td>
<td>Research Assistant (Co-op): Android Developer for Multiple View Perspectives project</td>
<td>Summer 2011</td>
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## Grants

### Grants and Gifts: External

<table>
<thead>
<tr>
<th>Grant</th>
<th>Type</th>
<th>Principal Investigator</th>
<th>Year</th>
<th>Amount</th>
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<tbody>
<tr>
<td>GGE.5 REU Supplement</td>
<td>Principal Investigator</td>
<td>2013-2014</td>
<td>$16000</td>
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<tr>
<td></td>
<td></td>
<td>Design, evaluate and refine usability, presentation and readability issues for a new real-time crowd-sourced captioning software approach for deaf and hard of hearing students. The project will also evaluate technology and audiovisual factors in mainstream classroom.</td>
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<tr>
<td>GGE.4 Time Warner Research Program</td>
<td>Principal Investigator</td>
<td>2012-2013</td>
<td>$20000</td>
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<td></td>
<td></td>
<td>Develop policy and design recommendations for inclusive virtual peer communities for students with sensory disabilities.</td>
<td></td>
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<tr>
<td>GGE.3 MS Windows Mobile Phone Grant</td>
<td>Principal Investigator</td>
<td>2012-2013</td>
<td>$4000</td>
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<td></td>
<td></td>
<td>Microsoft Corporation Equipment Grant. Develop curriculum for a new course to teach application development skills for Windows Mobile Phones for Deaf and Hard of Hearing Students.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GGE.2 NSF Collaborative Captioning</td>
<td>Principal Investigator</td>
<td>2012-2015</td>
<td>$97446</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Design, evaluate and refine usability, presentation and readability issues for a new real-time crowd-sourced captioning software approach for deaf and hard of hearing students. The project will also evaluate technology and audiovisual factors in mainstream classroom.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GGE.1 NSF ASL-STEM</td>
<td>Senior Personnel</td>
<td>2012-2013</td>
<td>$69181</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DHH Cyber Community - Supporting Deaf and Hard of Hearing Students in STEM Fields Develop and post new and unique video recordings of STEM vocabulary signs and related definitions to the ASL STEM Forum web site.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total External Grants</td>
<td></td>
<td></td>
<td>2011-2015</td>
<td>$206627</td>
</tr>
</tbody>
</table>
Grants and Gifts: Internal

<table>
<thead>
<tr>
<th>Grant Number</th>
<th>Grant Title</th>
<th>Principal Investigator</th>
<th>Years</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>GGI.5</td>
<td>Provost’s Learning Innovation Gr.</td>
<td>Principal Investigator</td>
<td>2013-2014</td>
<td>$5000</td>
</tr>
<tr>
<td></td>
<td>Closed Visual Cues for Introductory Programming Tutorial Videos.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GGI.4</td>
<td>Effective Access Technology Grant</td>
<td>Principal Investigator</td>
<td>2012-2013</td>
<td>$7180</td>
</tr>
<tr>
<td></td>
<td>Accessible Viewing Device: Eye-Gaze-Controlled Live Replay to Automatically Review Missed Information.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GGI.3</td>
<td>College of Science Grant</td>
<td>Co-Principal Investigator</td>
<td>2012-2013</td>
<td>$48395</td>
</tr>
<tr>
<td></td>
<td>3-D Computer Vision System for Synthesizing American Sign Language in Avatars: Design a system for ASL signers to automatically record signs that will be used to synthesize virtual human signers.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GGI.2</td>
<td>Boot Camp Seed Grant</td>
<td>Principal Investigator</td>
<td>2011-2012</td>
<td>$5000</td>
</tr>
<tr>
<td></td>
<td>Viewing Devices: Enhance Classroom Access by identifying and quantifying visual cues to aid deaf and hard of hearing students manage attentional resources in mainstreamed classrooms.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GGI.1</td>
<td>NTID Innovation Grant</td>
<td>Principal Investigator</td>
<td>2011-2013</td>
<td>$76922</td>
</tr>
<tr>
<td></td>
<td>Empowering Mainstreamed DHH Students with Personal Multiple View Perspectives: Develop a mobile personalized multiple video platform that reduces cognitive load for deaf and hard of hearing students in mainstreamed classrooms.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Internal Grants</strong></td>
<td></td>
<td></td>
<td><strong>2011-2015</strong></td>
<td><strong>$142497</strong></td>
</tr>
</tbody>
</table>
### Honors and Awards

#### Teaching

HAT.01 Heavy Hitters Award for Most Active Course (Top 1%) Fall 2013

#### Research

<table>
<thead>
<tr>
<th>Award Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAR.03 NTID Scholarship Award for Pre-Tenure Faculty</td>
<td>2012-13</td>
</tr>
<tr>
<td>HAR.02 Gallaudet University Alumni Association Graduate Fellowship</td>
<td>2005-08</td>
</tr>
<tr>
<td>HAR.01 Alexander Graham Bell Association: Robert Weitbrecht Scholarship</td>
<td>1988-90</td>
</tr>
</tbody>
</table>

#### Workshop and Conference Travel Grants

<table>
<thead>
<tr>
<th>Conference Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAW.08 POD Leadership Institute, Inclusive Leadership, Ithaca, NY</td>
<td>Jun 2014</td>
</tr>
<tr>
<td>HAW.07 CURM Student Research Conference, Salt Lake City, UT</td>
<td>Mar 2014</td>
</tr>
<tr>
<td>HAW.06 Signing Creatures Workshop, Washington, DC</td>
<td>Nov 2013</td>
</tr>
<tr>
<td>HAW.05 National Labs Professional Development Workshop, Oak Ridge, TN</td>
<td>May 2013</td>
</tr>
<tr>
<td>HAW.04 Academic Career Workshop, Atlanta, GA</td>
<td>Mar 2012</td>
</tr>
<tr>
<td>HAW.03 Accessible Electronic Health Records Workshop, Orlando, FL</td>
<td>Oct 2010</td>
</tr>
<tr>
<td>HAW.02 Pervasive Computing Conference, Mannheim, Germany</td>
<td>Mar 2010</td>
</tr>
<tr>
<td>HAW.01 Academic Career Workshop, Houston, TX</td>
<td>Feb 2010</td>
</tr>
</tbody>
</table>

### Professional and Research Development

#### Research and Administration

<table>
<thead>
<tr>
<th>Event Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRA.29 POD Leadership Institute, Inclusive Leadership, Ithaca, NY</td>
<td>June 6-12, 2014</td>
</tr>
<tr>
<td>PRA.28 Tenure and Promotion Workshop</td>
<td>Apr 17, 2014</td>
</tr>
<tr>
<td>PRA.27 Logic Model Training Workshop</td>
<td>Apr 9, 2014</td>
</tr>
<tr>
<td>PRA.26 Access Technology Commercialization Workshop</td>
<td>Feb 8, 2014</td>
</tr>
<tr>
<td>PRA.25 NIH Grantseeking without Grief</td>
<td>Jan 22, 2014</td>
</tr>
<tr>
<td>PRA.24 Project Management Skills for Non-Project Managers</td>
<td>Nov 14, 2013</td>
</tr>
<tr>
<td>PRA.23 Early Alert Training (Starfish)</td>
<td>Sep 27, 2013</td>
</tr>
<tr>
<td>PRA.22 NSF Day Workshop</td>
<td>Nov 8, 2013</td>
</tr>
<tr>
<td>PRA.21 The Budget Process at NTID</td>
<td>May 9, 2013</td>
</tr>
<tr>
<td>PRA.20 Writing Successful Grants</td>
<td>Mar 22, 2013</td>
</tr>
<tr>
<td>PRA.19 Accounting for Cost Share Commitments</td>
<td>Jan 24, 2013</td>
</tr>
<tr>
<td>PRA.18 Evaluation and Assessment</td>
<td>Jan 16, 2013</td>
</tr>
<tr>
<td>PRA.17 Guidelines for Planning NTID Events</td>
<td>Jan 8, 2013</td>
</tr>
<tr>
<td>PRA.16 Responding to Department of Defense Broad Agency Announcements</td>
<td>Dec 6, 2012</td>
</tr>
<tr>
<td>PRA.15 RIT Educational Benefits</td>
<td>Dec 4, 2012</td>
</tr>
<tr>
<td>PRA.14 Other Direct Costs</td>
<td>Nov 8, 2012</td>
</tr>
<tr>
<td>PRA.13 Oracle Reports</td>
<td>Oct 18, 2012</td>
</tr>
<tr>
<td>PRA.12 Oracle Journals</td>
<td>Oct 16, 2012</td>
</tr>
<tr>
<td>PRA.11 Oracle Requisitions</td>
<td>Oct 16, 2012</td>
</tr>
<tr>
<td>PRA.09 Research Compliance</td>
<td>Oct 11, 2012</td>
</tr>
<tr>
<td>PRA.08 Introduction to Accounting</td>
<td>Sep 20, 2012</td>
</tr>
<tr>
<td>PRA.07</td>
<td>Hiring, Supervising and Retaining Student Employees</td>
</tr>
<tr>
<td>PRA.06</td>
<td>Using Zotero: A Next-Generation Citation Management System</td>
</tr>
<tr>
<td>PRA.05</td>
<td>Getting Started in Funded Research</td>
</tr>
<tr>
<td>PRA.04</td>
<td>NIH Overview</td>
</tr>
<tr>
<td>PRA.03</td>
<td>Human Subjects Research</td>
</tr>
<tr>
<td>PRA.02</td>
<td>Peer Review</td>
</tr>
<tr>
<td>PRA.01</td>
<td>Technology Commercialization</td>
</tr>
</tbody>
</table>

### Teaching and Tutoring

| PTT.08 | Visual Studio 2012 and the C# Programming Language | January 12, 2014 |
| PTT.07 | Hearing and Deaf Cultures: A Comparison of Value Systems | Dec 5, 2013 |
| PTT.06 | Facilitating Cooperative Learning in Student Workgroups | Apr 22, 2013 |
| PTT.05 | Faculty Development Resources at The Wallace Center | Jan 11, 2013 |
| PTT.04 | Understanding RIT’s Student Learning, Support & Assessment Programs | Dec 10, 2012 |
| PTT.03 | Tutoring ... The Next Generation | May 24, 2012 |
| PTT.02 | Language Use in Research and Academic Settings | May 23, 2012 |
| PTT.01 | Working with NTID Students: Insights from Research and Scholarship | Sep 13, 2011 |

### Spoken Communication Techniques and Strategies

| PSC.06 | Current Trends in Technology and Software | Mar 13, 2014 |
| PSC.05 | “What is it like to Choose and Live with a Cochlear Implant” Deaf Author’s Diverse Perspectives | Feb 21, 2014 |
| PSC.03 | What’s App-ening? Exploring Communication Apps | Dec 12, 2013 |
| PSC.02 | NTID Students’ Communication Skills: Information and Access | Dec 14, 2012 |
| PSC.01 | SCTS Cochlear Implant Workshop | Jan 24, 2012 |

### Service - Department, College and Institute

#### Department Committees

| SDS.03 | Mobile Application Design and Development | 2013-14 |
| SDS.02 | Game Concentration | 2012-13 |
| SDS.01 | Department Faculty Job Search | 2011-12 |

#### College

| SCS.03 | NTID Faculty Council | 2012-14 |
| SCS.02 | NTID Faculty Teaching and Scholarship Award Committee | 2012-13 |
| SCS.01 | NTID Learning Consortium Committee | 2011-13 |

#### Institute

| SIS.02 | RIT Academic Senate | 2013-15 |
| SIS.01 | RIT IRB Committee | 2011-14 |
Service - Professional and Community

Professional Membership
SPM.03 ACM Member 2009-Now
SPM.02 IEEE Member 2009-Now
SPM.01 USENIX Member 2009-2010

Dissertation and Thesis Committees
SDC.01 M.S. Thesis Committee Member: John Costanzo, College of Science, RIT 2013

Peer Reviews
SPR.12 NIDRR: National Institutes of Disability and Rehabilitation Research 2013
SPR.11 ACM SRC: ACM National Student Research Competition 2013
SPR.10 SLTAT 2013: Symposium on Sign Language Translation and Avatar Technology 2013
SPR.09 CSCW: ACM Conference on Computer Supported Community Work 2013
SPR.08 RESNA: Rehabilitation Engineering Association of North America 2013
SPR.07 TACCESS: Transactions on Accessible Computing 2013
SPR.06 ACM SRC: ACM National Student Research Competition 2012
SPR.05 ASSETS: ACM Conference on Computers and Accessibility 2013
SPR.03 ASSETS: ACM Conference on Computers and Accessibility 2013
SPR.02 RESNA: Rehabilitation Engineering Association of North America 2012
SPR.01 TACCESS: Transactions on Accessible Computing 2011

Program Committees
SPC.06 Captioning Challenge Chair, ACM SIGACCESS 2014
SPC.05 Accessibility Chair, ACM SIGACCESS 2014
SPC.04 Captioning Challenge Chair, ACM SIGACCESS 2013
SPC.03 Accessibility Chair, ACM SIGACCESS 2013
SPC.02 Symposium on Sign Language Translation and Avatar Technology 2013
SPC.01 Accessibility Chair, ACM SIGACCESS 2012

Committees
SCM.03 Committee Member, U.S. FCC Consumer Advisory Committee 2011-14
SCM.02 Technical Director, Deaf Rochester Film Festival 2011
SCM.01 Founder/Moderator, Deaf South Asians Association 1998-Now

Last updated: May 15, 2014
Curriculum Vitae
Joseph S. Stanislow

Work Address:
National Technical Institute for the Deaf
Harry L. Carey Building, HLC-2219
96 Lomb Memorial Drive
Rochester, NY 14623-5604
Email: joseph.stanislow@rit.edu
Mobile: (585) 200-4237
Videophone: (585) 475-4664

Home Address:
30 Van Cortland Drive
Pittsford, NY 14534
Email: joseph.stanislow@outlook.com
Videophone: (585) 643-6716

- Academic and Professional Qualifications

Education

Stevens Institute of Technology, Hoboken, NJ
Degree: Master of Science, September 1999
Major: Computer Science

Rochester Institute of Technology, Rochester, NY
Degree: Bachelor of Science, May 1981
Major: Electrical Engineering Technology

National Technical Institute for the Deaf, Rochester, NY
@ Rochester Institute of Technology
Degree: Associate of Applied Science, May 1978
Major: Electro-Mechanical Technology

Relevant Professional Employment History

Full Time Faculty Position 2000 – Present
Information and Computing Studies Department
Rochester Institute of Technology/National Technical Institute for the Deaf, Rochester, NY

Teaching Faculty:
Information and Computing Studies Department
Developed and delivered technical courses in Associate of Applied Science (A.A.S.) and Associate of Occupational Studies (A.O.S.) level programs. Courses taught included Introduction to Programming and Computing Interfacing. Provided tutoring and student advising as needed.

Tutoring/Advising Faculty:
College of Computing and Information Science:
Tutored, advised, liaised with, and taught mainstreamed R.I.T. Deaf and Hard-of-Hearing students. Liaised with programs in the College of Computing and Information Sciences (GCCIS).
- Assisted teaching included Programming for I.T. I and III and Introduction to Dbase & Data Modeling.

**College of Engineering:**
Tutored, advised, liaised with, and taught mainstreamed R.I.T. Deaf and Hard-of-Hearing students. Liaised with programs in the College of Engineering, College of Applied Science and Technology, College of Continuing Education and NTID Engineering Technology programs.
- Provided tutoring included Circuit Theory I and II, ExCiTe Intro to ECT ET, Technical Programming 1, and Digital Fundamentals.
- Lead, implemented, and developed the ECT 2+2 Matrix for new Associate Science (AS) program with Electrical Engineering Technology (EET) and Computer Engineering Technology (CET) programs.

See CV Attachment 1 – Professional Employment History for the list of courses taught/tutored.

**Full Time and Co-op Engineering and Technician Corporate Positions**

**Software Developer**

**Innovative Desktop Solutions (IDS) Department**

**Avaya Inc., Holmdel, NJ**

Lead Developer of the PC based test tool platform for developing and testing new telephones with new proprietary communication protocol Digital Communications Protocol (DCP) and recently Call Centre Modules/Digital Communications Protocol (CCMS/DCP) for the Internet Protocol (IP). Coordinated team effort with electrical engineer, firmware, and system test engineers. Responsibilities included the strategy, system design and development, and PC application software. Responsible for the design, coding, testing, and implementations of new test tools and functions for new telephones. Software was written primarily in Visual Basic 6.0.

Member of a team that developed new CALLMASTER VI terminal. Responsible for design, coding, testing, and implementation of user friendly software applications which utilized CALLMASTER VI for the Middletown and Denver System Test groups, Field Service (technicians) and customers. Set up a development environment consisting of a PC, switch simulation (947C Test Set), and CALLMASTER VI. The software was written in Visual Basic 4.0. Responsible for the design, development, coding, testing and implementation of the software applications.

Developed and created WISE Installation System for uninstalling several software applications. Solved some problems with the CALLMASTER VI and worked very closely with the designers to resolve issues. Worked with System Test Group, the CALLMASTER VI team members, and customers to meet and satisfy their needs. The CALLMASTER VI with software I designed is currently in production.

Awarded the Golden Pyramid Award and Customer Sales and Service Solution Gold Key Award.
Physical Designer

Terminals Development Department
Lucent Technologies Inc., Middletown, NJ

1991 – 1994

Performed physical design of business telephones. Worked with design team to develop new products from conception through manufacture. Worked within aggressive development schedules to produce Design For Manufacturing (DFM) and cost effective design. Constructed conceptual telephone models using Pro/Engineer 3D CAD software for human factors studies prior to test marketing and production. Proposed design improvements in fit of plastic piece parts for new line of Merlin telephones which were subsequently accepted.

Inspected and analyzed physical models for test and design evaluation ensuring Zero defects and cost reductions. Designed, developed, and fabricated test fixtures for life cycle and ease of manufacturing assemblies. Evaluated and performed electrical, mechanical, and environmental testing on prototypes and components resulting in regulatory agency compliance. Performed Printed Wiring Board (PWB) schematic capture and layout in CADNETIX.

Coordinated team effort with physical and electrical designers, Engineering Information Department (EID) for Pro/Engineer design models, and human factors group to create a comprehensive design plan. Organized, managed, and administered CAD and physical design laboratories to facilitate achievement of department objectives.

Selected as Test Engineer for OEM FAX machines. Specifically, evaluated OEM FAX machines to verify if they meet AT&T’s requirements for new market product lines.

Awarded the 1994 Trailblazer Award. It acknowledged my excellent relations with Lucent customers.

Electrical Designer

Terminals Development Department
AT&T Bell Laboratories, Holmdel, NJ

1981 – 1990

Performed electrical design of business telephones. Worked with design team and human factors group to develop new products. Designed, developed and fabricated new Printed Wiring Boards (PWBs) then evaluated and performed electrical testing on prototypes and component. Successfully designed and tested analog/digital circuits of business telephones.

Co-op Engineering Aide

Card Test Development
International Business Machine Corporation, San Jose, CA

12/1980 – 05/1981

Built new card fixtures to test engineering changes for a mass storage device. Performed card testing with the use of word generators and logic analyzers. Devised test procedures and validated logic card results through simulation. Constructed wirewrap card models from schematics.

Co-op Engineering Aide

Test Development
International Business Machine Corporation, San Jose, CA

12/1979 – 05/1980
Assisted in design, revision, and evaluation of new mass storage devices.

**Co-op Engineering Aide**

**Test System Integration**

International Business Machine Corporation, East Fishkill, NY

06/1978 – 02/1979

Assisted in construction, debugging, and testing of silicon chip handler machines. Debugged power supply, clutch, brake systems, cables, and switches. Developed electronic fabrication from schematics. Assembled various machine accessories, i.e. safety covers, switches, and panel doors. Reorganized and redrafted schematics. Designed and built a safety interlock system for silicon chip handler machines. Performed engineering changes on new silicon chip handler machines.

**Part Time Position**

**Math Tutor**

National Technical Institute for the Deaf, Rochester, NY

1980

Tutored students in the Math Learning Center and assisted in curriculum development.

**Professional Certifications**

- Certified CompTIA A+, Career ID: COMP001020096645, June 2010
  
  (The Professional A+ Certification by CompTIA, Advancing the Global IT Industry demonstrates competency as a computer technician.)

- Certified CompTIA Network+ Certification, Career ID: COMPO01020096645, December 2010

  (The CompTIA Network+ Certification is the sign of a qualified networking professional.)

**Scholarship**

Grants, Awards, Scholarships, Honors, Innovations, Projects

An NTID Center on Access Technology (CAT) Projects; Lead Institutions were Rochester Institute of Technology (RIT) and National Technical Institute for the Deaf (NTID) by DeCaro, J.J. Projects Co-Supervised and Subject-Matter Expert (SME):

**Theatre Captioning System (TCS) Project:** Behm, G.W., Kelstone, A.B., and Stanislow, J.S. for Buckley, G.J, and DeCaro, J.J., Rochester, NY, 2014

**Doorbell Light System (DLS) Project:** Behm, G.W., and Stanislow, J.S., for Knigga, C.M., Rochester, NY, 2014

**Programmable Sound Detector (PSD) Project (continued):** Behm, G.W., Stanislow, J.S., Saber, E.S., and Bowman, R.J., Rochester, NY, 2014

**Programmable Sound Detector (PSD) Project:** Behm, G.W. and Stanislow, J.S. for Gallaudet University, Rochester, NY, 2014

**Lab Instrument Sound Detector (LSID) Project:** Behm, G.W. and Stanislow, J.S. for Gallaudet University, Rochester, NY, 2013


Faculty Evaluation and Development (FEAD) grant 2009 California Educators of the Deaf and Hard of Hearing (CAL-ED) Conference, Board meeting/ exhibit booth, CAID Council for Region 1 and Treasurer, March 6-9, 2008


Published DHH Cyber-Community Summary Report Final 2009.
The National Science Foundation under Award No. OCI-0749253

Available at: http://www2.rit.edu/plig/MGiardinoProvost%27sInnovationsGrant05.pdf

Golden Pyramid Award and Customer Sales and Service Solution Gold Key Award, Avaya Inc., 1996

1994 Trailblazer Award, Lucent Technologies, 1994

Peer-Reviewed Papers

Kushalnagar, R., Behm, G.W., Stanislow, J.S. & Gupta, V. (2014, October) The 2014 ASSETS Conference, the proposal titled, Enhancing Caption Accessibility through simultaneous multimodal information: Visual-Tactile Captions has been accepted, Rochester, NY. In-press. [Acceptance rate: 26%]

Available at: http://dl.acm.org/citation.cfm?id=2157380&CFID=501166035&CFTOKEN=37926535

Other Publications: Abstracts, Presentations, Posters, Workshops, & Exhibits

International Conferences


Available at: http://www.rit.edu/ntid/vp/techsym/detail.html#W10D

Available at: http://www.rit.edu/ntid/vp/techsym/papers/2008/T9C.pdf

National Conferences


**Regional Conferences**


**Institute Presentations**


**Invited Presentation, Talks, and Working Group**


*Faculty Focus Group* from the Provost, Jeremy Haefner to share their perceptions of teaching online, (2011, January), Rochester, NY, January 20, 2011

Stanislow, J.S. (2010, April) *“Robotics” Workshop* presented at the remarkable Discovery Retreat in Killeen, TX for the NTID Outreach Department, Texas.

Curriculum/Course Development/Course Taught

Curriculum Development
AAS Degree Program/Major in Mobile Application Development (MAD), Selected Committee
Major revision to the AOS, AAS, and AS Programs in Applied Computer Technology (ACT) – Quarter-to-Semester Conversion
Project Fast Forward (PFF) under Technological Education Center for Deaf and Hard-of-Hearing Students (DeafTEC)
Introduction to Programming
Deaf Initiative in Information Technology (DIIT)
Introduction to Microsoft Visual Basic.NET
Introduction to Java Programming
Introduction to ASP.NET
Professional Fall 20051 Leave of Absence (LOA)
Introduction to Microsoft Visual Basic .NET
Introduction to Microsoft Visual Basic .ASP

Course Development
AAS Degree Program/Major in Mobile Application Design and Development (MADD), Selected Committee
Major revision to the AOS and AAS Degree Programs in Applied Computer Technology (ACT) – Quarter-to-Semester Conversion
- NACT-150 Introduction to PC Hardware
- NACT-151 Windows Operating Systems
- NACT-251 Digital Systems Integration
- NACT-230 Intro to Programming (new Visual C#)

Significantly revised existing course materials and developed new course materials including lecture slides, practice exercises, homework assignments, quizzes, and tests for the following courses due to CURRENT TRENDS in the information and computing technology.

NACT-251 Digital Systems Integration (revised course) 2135
NACT-151 Windows Operating Systems (revised course) 2135
0805-215 PC Operating Systems (revised course) 20113
0805-350 Digital Technology Integration (revised course) 20113
0805-216 PC Hardware I (revised course) 20112
0805-217 PC Hardware II (new edition course) 20112
0805-350 Digital Technology Integration (development) 20112
0805-216 PC Hardware I (new edition course) 20111
0805-215 PC Operating Systems (revised course) 20103
0805-350 Computer Interfacing (revised course) 20103
0805-217 PC Hardware II (revised course) 20102
0805-230 Introduction to Programming (revised course) 20102
0805-216 PC Hardware I (revised course) 20101
0805-230 Introduction to Programming (revised course) 20101
0805-215 PC Operating System (new edition course) 20083
0805-350 Computing Interfacing (revised course) 20082
0805-230 Introduction to Programming (new edition course) 20082
0805-230 Introduction to Programming (new edition course) 20081
0805-350 Computer Interfacing (new revised course) 20072
0805-230 Introduction to Programming (new edition course) 20071
0805-350 Computer Interfacing (revised course) 20063
0805-398 Special Topic: Java Programming Language (new course) 20052
Project Fast Forward (PFF) under Technological Education Center for Deaf and Hard-of-Hearing Students (DeafTEC)
Introduction to Programming (new workshop)
Deaf Initiative in Information Technology (DIIT) 2005-2006
Introduction to Microsoft Visual Basic.NET (new workshop)*
Introduction to ASP.NET (new workshop)*
Introduction to Java Programming (new workshop)
Business and Computing Technologies Support (BCTS) 20042
0853-310 Computing Fundamentals Course (new edition course)

*Professional Leave of Absence (LOA) for the Deaf Initiative in Information Technology (DiiT) Project

Professional Organizations

CompTIA A+, Advancing the Global IT Industry, Member 2010-Present
CompTIA Network+, Advancing the Global IT Industry, Member 2010-Present
American Society for Engineering Education (ASEE), Member 2010-Present
Council of American Instructors of the Deaf (CAID), Board Member and Council Technical Advisor 2009-Present
Council of American Instructors of the Deaf (CAID), Member 2002-Present
Association for Computing Machinery (ACM) in Society for Information Technology Education (SITE), Member 2002-Present
NTID Alumni Chapter Upstate New York (NACUNY), Member 2001-Present
California Educators of the Deaf and Hard of Hearing (CAL-ED), Member 2005-2013
FIRST Robotics: FIRST (For Inspiration and Recognition of Science and Technology), Member 2009-2011
Council of American Instructors of the Deaf (CAID), Board Member and Region 1 Representative 2007-2009
Council of American Instructors of the Deaf (CAID), Board Member and Treasurer 2007-2009
National Academic Advising Association (NACADA), Member 2003-2007
NTID Alumni Chapter Upstate New York (NACUNY), Board Member at Large 2001-2003

Consulting with State and National Level


NTID Committees

- NTID Outstanding Scholarship Committee, Member 2009-Present
- NTID Trustees Scholarship Award Committee, Member 2011-2014
- NTID Tenure Committee, Member 2011-2013
- Information and Computing Studies (ICS) Innovation Committee, Member 2009-2011
- NTID’s Department of Information and Computing Studies Tenure Track Search Committee, Member 2008-2009
- NTID Faculty Congress (NFC), At-Large then Information then Computing Studies (ICS) representative 2001-2009
- NTID’s Department of Information and Computing Studies Tenure Track Search Committee, Member 2005-2006
- Academic Potential Outreach Team, Faculty 2005-2006
- NTID Outstanding Scholarship Committee, Co-Chairperson 2004-2009
- NTID Steering Committee on Communication (SCC), Member 2004-2007
- NTID’s Department of Information Technology and Computing Studies Administrative Chairperson Search Committee, Chairperson 2004-2005
- Substructure of Combined Department, Faculty 20041AY
- NTID Outstanding Scholarship Committee, Member 2002-2003
- NTID Equipment Priorities and Allocation Committee, Member 2001-2006

RIT-Wide Committees

- Worked with Thomas B. Golisano College of Computing and Information Sciences (GCCIS) and Information Technology (IT) Departments 2000-2007
- Information Sciences and Technologies MS Capstone Project Committee for Golisano College of Computing and Information Sciences, Member 20042-20043

Interdepartmental Activities

- Summer Vestibule Program (SVP), Outreach Department, Instructor 2001-Present
- TechGirlz, Outreach Department, Instructor 2011
- Explore Your Future (EYF), Outreach Department, Instructor 2011
- 2nd National Math Competition, Proctor 2008
- Explore Your Future (EYF), Outreach Department, Instructor 2005-2007

Advising for Student Organizations/Groups/Functions

- NTID Geek Club (NGC), Faculty Advisor 2013- Present
- NTID Computer Club (NCC), Faculty Advisor 2002-2013
- Dean’s Student Leadership Advisory Group (DSLAG), Representative 2004-2007

Contributions to the Community

Consulting for Local Organizations & Groups

- Co-founded, launched, and implemented Rochester School for the Deaf FIRST (For Inspiration and Recognition of Science and Technology) RoBoComm-X Team 3162 2009-2011
- NTID Alumni Chapter of Upstate New York (NACUNY) 2001-2010
Greater Rochester Deaf Golf Association (GRDGA) 2004-2009
RIT Golf League 2004-2006
U.S. Deaf Golf Championships (USDG) Committee 2004-2005
7th Annual NTID Alumni Golf Tournament Committee 2004-2005
Deaf Girls of Rochester – assisted in their activities 2001-2006
Deaf Boys of Rochester – assisted in their activities 2001-2006
NTID Alumni Golf Tournament 2003-2005
RIT Golf League 2003-2004
NTID Alumni Chapter of Upstate New York (NACUNY) as Member at Large 2001-2003

Community Activities:
Co-Coach for 3rd National Math Competition for the BOCES #1’s team of four 2009
– 4th place: BOCES #1 Team.
Facilitator for 2009 NTID National Science Fair for Deaf and Hard-of-Hearing Students, 2009
– Middle School Division – 2nd place: Sarah Stanislow and Hope Basille, 7th grade, Barker Road Middle School, Pittsford, N.Y for “Solvents and Stains”
– Middle School Division - 1st place: Sarah Stanislow, 6th grade, Barker Road Middle School, Pittsford, N.Y. For “Does the Insulation Really Work?”
Invited Presentation for Rochester Deaf Rotary Club 2008
– Presented my fabulous West Trip to and received the Certificate of Appreciation
Committee for 8th Annual NTID Golf Tournament 2007
Volunteer for Camp Mark Seven (Camp for the Deaf and Hard of Hearing) 2007-2010
– Assisted in the efforts necessary for the opening and closing of the camp.
Committee and Facilitator for Deaf Boys of Rochester 2002-2006
Committee and Facilitator for Deaf Girls of Rochester 2002-2006

Other:
Developed, designed and maintained three websites:
1. CAID Organization and Conference website 2007-Present
2. FIRST® (For Inspiration and Recognition of Science and Technology) RoBoComm-X Team 3162 website for Rochester School for the Deaf (RSD). 2009-2011
3. Rochester School for the Deaf Alumni Association (RSDAA) website. 2008-2010
**CV Attachment 1 – Professional Employment History**

**Course Taught/Tutored (Activities in Primary Areas of Job Responsibility)**

**Teaching:**

NACT-151 Windows Operating Systems (two sections) 2135
NACT-251 Digital Systems Integration 2135
NACT-150 Introduction to PC Hardware (two sections) 2131
NACT-151 Windows Operating Systems 2131
0805-215 PC Operating Systems 2123
0805-350 Digital Technology Integration (two sections) 2123
0805-217 PC Hardware II 2122
0805-230 Intro to Programming 2122
0805-216 PC Hardware I (two sections) 2121
0805-215 PC Operating Systems 2121
0805-215 PC Operating Systems 2113
0805-350 Digital Technology Integration (two sections) 2113
0805-217 PC Hardware I 2112
0805-217 PC Hardware II 2112
0805-217 PC Hardware I (three sections) 2111
0805-215 PC Operating Systems (two sections) 2103
0805-350 Computer Interfacing 2103
0805-217 PC Hardware II (two sections) 2102
0805-230 Introduction to Programming 2102
0805-216 PC Hardware I 2101
0805-230 Introduction to Programming (two sections) 2101
0805-215 PC Operating Systems 2093
0805-251 Web Development I (two sections) 2093
0805-216 PC Hardware II (two sections) 2092
0805-230 Introduction to Programming 2092
0805-216 PC Hardware I (two sections) 2091
0805-230 Introduction to Programming (two sections) 2091
0805-217 PC Hardware II 2083
0805-215 PC Operating Systems (two sections) 2083
0805-216 PC Hardware I (two sections) 2082
0805-217 PC Hardware II 2082
0805-216 PC Hardware I 2081
0805-230 Introduction to Programming (two sections) 2081
0805-350 Computer Interfacing (two sections) 2073
0805-230 Programming I 2072
0805-230 Programming I (two sections) 2071
0805-398 Special Topics: Java Programming Language 20052
Professional Leave of Absence (LOA) for the Deaf Initiative in Information Technology (DiIT) Project 20051
0805-398 Special Topics: Java Programming Language 20042
0853-310 Computing Fundamentals course 20041
0853-310 Computing Fundamentals course 20033
0853-310 Computing Fundamentals course 20023
0805-230 Programming I 20021
Co-teaching IT courses with supported sections:
4002-360 Introduction to Dbase and Data Model, Kevin Bierre. 20063
4002-217 Programming for I.T. I 20062
4002-219 Programming for I.T. III 20061
0853-310 Computing Fundamentals course 20021
0853-310 Computing Fundamentals course 20011
0853-310 Computing Fundamentals course 20001
4002-217 Introduction to Programming I course, Bryan French 20053
4002-218 Introduction to Programming II course, Pete Lutz 20053
4002-218 Introduction to Programming II course, Steve Zilora 20052
4002-217 Introduction to Programming I course, Bryan French. 20042
4002-221 Introduction to Programming IIb course with Keith Whittington. 20033
4002-221 Introduction to Programming IIa course with Keith Whittington. 20032
4002-219 Introduction to Programming III course with Michael Flosser. 20031
4002-221 Introduction to Programming IIb course with Keith Whittington. 20023
4002-217 Introduction to Programming I course with Steve Zilora. 20022
4002-220 Introduction to Programming IIa course with Keith Whittington. 20022
4002-217 Introduction to Programming I course with Edward Holden. 20021
4002-217 Introduction to Programming I course with Anne Haake. 20013
4002-217 Introduction to Programming I course with Keith Whittington. 20012
4002-217 Introduction to Programming I course with Larry Hill. 20012
0602-215 Introduction to Visual Programming I Studio with Perez-Hardy. 20003
0602-215 Laboratory for Visual Programming I as the lab assistant. 20002

Tutoring:
0609-214 Circuit Theory I
0609-215 Circuit Theory II
0618-213 ExCITE Intro to ECT ET
0618-231 Technical Programming I
0618-301 Digital Fundamentals
4002-217 Introduction to Programming I
4002-218 Introduction to Programming II
4002-220 Introduction to Programming IIa
4002-221 Introduction to Programming IIb
4002-219 Introduction to Programming III
4002-320 Introduction to Multimedia
4002-360 Introduction to Dbase & Data Modeling
4002-402 OS Scripting
4002-461 Fundamental Data Modeling
4002-217 Introduction to Programming I
4002-218 Introduction to Programming II
4002-220 Introduction to Programming IIa
4002-221 Introduction to Programming IIb
4002-219 Introduction to Programming III
4002-320 Introduction to Multimedia
4002-340 Computer Concepts and Software Systems
4002-341 Data Communications and Computer Networks
4002-342 Internetworking Laboratory
4002-402 OS Scripting
4003-231 Computer Science 1
0112-360 MIS Hardware and Operating System Architecture (3)
0112-335 MIS Visual Basic/GUI Design (3)
0602-340 Computer Concepts and Software Systems
0602-341 Data Communications and Computer Networks
0602-215 Laboratory for Visual Programming I
0602-215 Introduction to Visual Programming I
0602-320 Introduction to Multimedia
0602-342 Internetworking Laboratory
I. ACADEMIC AND PROFESSIONAL QUALIFICATIONS

EDUCATION

M.S. in Information Technology 2005
Rochester Institute of Technology, Rochester, N.Y.
Areas of Concentration: Instructional Technology, Multimedia and Web Development

B.S. in Business Administration – Marketing 2000
Rochester Institute of Technology, Rochester, N.Y

RELEVANT PROFESSIONAL EMPLOYMENT HISTORY

Assistant Professor 2003 – Present
Rochester Institute of Technology/National Technical Institute for the Deaf
Information & Computing Studies, Rochester, N.Y.
Hired as a visiting instructor for the NTID Business & Computing Technology Support team with the primary responsibility of tutoring deaf students in Information Technology. Was hired in a tenure-track position in the Information Computing Studies to tutor and teach a variety of courses to deaf students in areas of Java programming, Web development, database and multimedia. Developed syllabus and overall course structure, and administered all grades. Faculty positions within NTID have included: Assistant Professor (2011 – present), Instructor (2006 – 2011), Visiting Instructor (2003-2006).

COMMUNICATION SKILLS

Sign Language

Advanced Plus to Superior Plus SCPI rating achieved 2006

PROFESSIONAL DEVELOPMENT

Conferences

• Society of Information Technology & Teacher Education Conference, 2011, March 8 -12, 2011
• Special Interest Group in Computer Science Education (SIGCSE) Conference 2010, March 10-13, 2010
• AFCOM Spring 2009 Data World Conference, March 8 – 12, 2009
• Society on Information Technology and Teacher Education (SITE) Conference 2011, March 8-12, 2011
II. PROFESSIONAL ACTIVITIES & SCHOLARSHIP

GRANTS, AWARDS, SCHOLARSHIPS, HONORS

*Android Development Collaboration with VL2 (VL2 ADC Project)*, Co-PI, Sponsored Research Services, 2013, $48,000

*Classroom Research for Preliminary Findings: Use of SLIM to Teach Content Areas to RIT/NTID Students*, Co-PI, NTID Research Center for Teaching and Learning, 2012, $8,400

*Empowering Mainstreamed Deaf and Hard-of-Hearing Students with Personal Multiple View Perspectives*, PI, NTID 2010 Innovation Funding Award, 2011, $76,922

*See-Through Monitor Project*, Co-PI, NTID 2010 Innovation Funding Award, 2011, $62,828

PUBLICATIONS


PRESENTATIONS, PAPERS, WORKSHOPS, EXHIBITS

International Conference


National Conference

Trager, B.P. and Kushalnagar, R.S. (March 2011). **Impact of Direct Tutoring that utilizes visual learning and translations for Deaf Students**: Poster presented at SIGCSE 2011: 42nd ACM Special Interest Group in Computer Science Education, Dallas, TX.


**Regional Conference**


**Campus Presentations**

Kushalnagar, R.S. & Trager, B. (May 2011). **Multiple Video Recordings: Universal Access for NTID Supported Classroom Recordings.** Presented at the Faculty Institute of Teaching and Learning Conference 2011, Rochester, NY.

Trager, B. & Kushalnagar, R.S. (May 2011). **Efficacy of a Direct Learning Tutoring Tool for Deaf and Hard of Hearing Students.** Presented at the Faculty Institute of Teaching and Learning Conference 2011, Rochester, NY.


**Invited Presentation**

Trager, Brian (July 2011). **Academic Career in Computing.** Summer Academy 2010 at University of Washington, Seattle, WA.

**CURRICULUM, COURSE DEVELOPMENT, INSTRUCTIONAL MATERIALS**

**Course Development**

Significantly revised existing course materials and developed new course materials including lecture slides, practice exercises, assignments, quizzes, and tests for the following courses.

- **Networking Essentials** (new course) 2005-1
- **Programming Fundamentals** (revised course) 2007-1
- **Web Server Technologies** (revised course) 2007-3
- **Web Development I** (revised course) 2009-2
- **Programming Fundamentals** (revised course) 2010-1
- **Windows Phone App Development** 2012-3
- **Programming Fundamentals I*** 2013-1
- **Programming Fundamentals II**** 2013-1
- **Website Development**** 2013-1
- **Website Implementation**** 2013-1
Special Topics Course

Taught and developed materials for a special topics course in Windows Phone App Development to teach students on creating apps for the Windows Phone platform. This will be offered a second time in Spring Semester 2014 due to popular demand.

Taught and developed materials for a special topics course in Introduction to Windows Vista during Winter Quarter 062. Course was designed to enable students to meet the anticipated job market demand for skills in the Windows Vista operating system.

Curriculum Development

Information & Computing Studies AS Program for Semester Conversion 2013

Co-authored a program proposal for an Associate of Science Degree in Applied Computer Technology. Approved by the NTID Curriculum Committee and the Institute Curriculum Committee in 2011. Negotiated a formal transfer agreement with GCCIS’s Information Technology Department.

WORKSHOP

PHP 6 & MySQL 5 Workshop Presenter July 13 – 17, 2009

Trained deaf computer programmers from across the U.S. in a one-week Deaf Initiative in Technology workshop covering basic & intermediate level PHP scripting and foundations of MySQL. (Workshop held at NTID)

PROFESSIONAL ORGANIZATIONS

Council of American Instructors of the Deaf (CAID) 2009 – 2013
Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) 2013
ACM, Special Interest Group in Computer Science Education (SIGCSE) 2010 – 2011
Society of Information Technology & Teacher Education (SITE) 2011

MENTORING

Project Fast Forward Teacher Consultant 2009-2012
Train and consult individuals in New York, Indiana and North Carolina with Web Development I and PC Hardware courses.

CONSULTANT WORK – STATE/NATIONAL LEVEL

Web/Marketing Consultant, Awti Productions (www.awtiproductions.com) 2008-2010

III. CONTRIBUTIONS TO THE INSTITUTE

INSTITUTE AND COLLEGE COMMITTEES

NTID Innovation, Scholarship, and Research Committee, Member 2010 – present
NTID Faculty Congress, currently Co-Chair 2008-present
NTID Equipment Review Committee, Member 2008-present
NTID Web Advisory Committee, Member 2008-present
NTID Innovation Funding Committee, Member 2010-2011
NTID Marketing Communications Web Developer Search Committee, Member 2009-2010
Information & Computing Studies Tenure Track Search Committee, Member 2007-2009
Information & Computing Studies Social Events Committee, Member 2008-2009
INTERDEPARTMENTAL ACTIVITIES

Summer Vestibule Program, Outreach Department, Instructor & Coordinator* 2005-present
* - Coordinator for ICS in 2010 & 2011
TechGirlz, Outreach Department, Instructor 2008 – present
Step to Success, Outreach Department, Instructor 2008 – 2010
Explore Your Future, Outreach Department, Instructor 2007 – 2009
Information Technology, In-service Training, Department of Access Services, Instructor 2009
NTID Math Competition, Proctor 2009
History of Computers, Career Exploration Studies, Guest Speaker 2008
The Future of Technology, Career Exploration Studies, Guest Speaker 2009 – 2010

ADVISING CONTRIBUTIONS

NTID Geek Club Faculty Advisor 2006 – present
Support and gave advice to more than 30 deaf and hard-of-hearing students in the club with strong interest in computers and future technologies.
Big Brother/Big Sister Advisor, Information & Computing Studies Dept. 2009 – 2010
As part of student retention efforts, I serve as advisor to encourage 2nd and 3rd year students to mentor 1st year students. I worked with other advisors to coordinate several events to promote social interactions among ICS students in this program.

OTHER CONTRIBUTIONS

Golisano Lab Manager, ICS Department 2008 – 2011

IV. CONTRIBUTIONS TO THE COMMUNITY

CONSULTANT WORK FOR LOCAL ORGANIZATIONS

Pro Bono: Milestone Months (milestonemonths.com), Web Developer & Consultant 2010-present

LOCAL COMMUNITY PRESENTATIONS

“Secrets of Windows Vista”, Presenter April 25, 2008
“Upgrade Your Future”, Presenter May 9, 2007
“A Sneak Peek into Windows Vista”, Presenter November 1, 2006

COMMUNITY VOLUNTEER ACTIVITIES

Rush Henrietta Athletic Association T-Ball League, Assistant Coach 2011
Rochester Deaf Golf League (Wildwood), Webmaster 2009
40th NTID Alumni Reunion Registration Committee, Chairperson 2007-2008
NTID Alumni Golf Tournament Committee, Member 2007
Rochester Deaf Sports Organization, Webmaster 2003-2005
Taught evening sign language class at Victory Baptist Church 2001
Rochester Boys and Girls Club, Volunteer 2000
Appendix G – Cost Model: Revenue/Cost Projections/Expenses

The NTD cost model analysis prepared by Mr. Steven Morse, the Assistant Vice-President for NTID Finance and Budget includes four tables detailing projected expenditures and revenue over the first five years of the program. There are no anticipated capital expenditures.

Table 1 below shows the projected expenditures for each of the first five years of the proposed program. These expenditures include faculty/staff salary and benefits plus costs such as computers, instructional supplies, telephone, software licenses, travel/conferences, tuition payment for RIT credits and RIT indirect costs. The grand total costs, which total $605,500 in Year 5, include the incremental cost of 1 FTE Lecturer to be hired in AY2017-18 to teach courses in other ICS programs that would have been taught by faculty now assigned to teach in the Mobile Application Development program.

Table 1 – Projected Expenditures

<table>
<thead>
<tr>
<th>Table 1 – Projected Expenditures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Information and Computing Studies Department</strong></td>
</tr>
<tr>
<td><strong>Mobile Application Development Associate of Applied Science Degree Program</strong></td>
</tr>
<tr>
<td><strong>Projected Expenditures For The Proposed Program</strong></td>
</tr>
<tr>
<td><strong>Table 1</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 1 (AY16-17)</th>
<th>Year 2 (AY17-18)</th>
<th>Year 3 (AY18-19)</th>
<th>Year 4 (AY19-20)</th>
<th>Year 5 (AY20-21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty Positions (2.67 FTE) - Salary</td>
<td>$188,400</td>
<td>$194,100</td>
<td>$199,900</td>
<td>$205,000</td>
<td>$212,100</td>
</tr>
<tr>
<td>Staff Assistant (0.05 FTE) - Salary</td>
<td>$2,300</td>
<td>$2,400</td>
<td>$2,500</td>
<td>$2,600</td>
<td>$2,700</td>
</tr>
<tr>
<td>Benefits</td>
<td>$72,000</td>
<td>$77,000</td>
<td>$81,000</td>
<td>$85,000</td>
<td>$88,000</td>
</tr>
<tr>
<td><strong>Total Salary and Benefits</strong></td>
<td><strong>$262,700</strong></td>
<td><strong>$273,500</strong></td>
<td><strong>$283,400</strong></td>
<td><strong>$293,600</strong></td>
<td><strong>$302,800</strong></td>
</tr>
<tr>
<td>Additional 1.0 FTE Required for Home Dept</td>
<td>$66,000</td>
<td>$68,100</td>
<td>$68,100</td>
<td>$68,100</td>
<td>$68,100</td>
</tr>
<tr>
<td>Salary &amp; Benefits</td>
<td>$8,100</td>
<td>$8,100</td>
<td>$8,100</td>
<td>$8,100</td>
<td>$8,100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$340,800</strong></td>
<td><strong>$351,600</strong></td>
<td><strong>$351,500</strong></td>
<td><strong>$351,700</strong></td>
<td><strong>$351,900</strong></td>
</tr>
<tr>
<td>Computer Charges</td>
<td>$18,600</td>
<td>$31,400</td>
<td>$37,400</td>
<td>$38,500</td>
<td>$39,600</td>
</tr>
<tr>
<td>Instructional Supplies</td>
<td>$2,000</td>
<td>$2,100</td>
<td>$2,200</td>
<td>$2,300</td>
<td>$2,400</td>
</tr>
<tr>
<td>Telephone</td>
<td>$700</td>
<td>$700</td>
<td>$700</td>
<td>$700</td>
<td>$700</td>
</tr>
<tr>
<td>Software Licenses</td>
<td>$2,000</td>
<td>$2,100</td>
<td>$2,200</td>
<td>$2,300</td>
<td>$2,400</td>
</tr>
<tr>
<td>Travel-Conferences</td>
<td>$2,900</td>
<td>$2,900</td>
<td>$2,900</td>
<td>$2,900</td>
<td>$2,900</td>
</tr>
<tr>
<td>Tuition Payments for RIT Credits</td>
<td>$39,000</td>
<td>$62,500</td>
<td>$74,700</td>
<td>$77,000</td>
<td>$79,300</td>
</tr>
<tr>
<td>Overhead (RIT Indirect Costs)</td>
<td>$6,600</td>
<td>$7,500</td>
<td>$8,000</td>
<td>$8,500</td>
<td>$9,000</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td><strong>$136,800</strong></td>
<td><strong>176,700</strong></td>
<td><strong>200,800</strong></td>
<td><strong>207,100</strong></td>
<td><strong>213,300</strong></td>
</tr>
<tr>
<td><strong>Total Program Costs</strong></td>
<td><strong>$392,600</strong></td>
<td><strong>$460,200</strong></td>
<td><strong>$484,200</strong></td>
<td><strong>$500,400</strong></td>
<td><strong>$516,100</strong></td>
</tr>
<tr>
<td>New Program Total Costs</td>
<td><strong>$392,600</strong></td>
<td><strong>$460,200</strong></td>
<td><strong>$484,200</strong></td>
<td><strong>$500,400</strong></td>
<td><strong>$516,100</strong></td>
</tr>
<tr>
<td>Grand Total Costs to NTD (including Additional 1.0 FTE)</td>
<td><strong>$392,600</strong></td>
<td><strong>$460,200</strong></td>
<td><strong>$484,200</strong></td>
<td><strong>$500,400</strong></td>
<td><strong>$516,100</strong></td>
</tr>
</tbody>
</table>

* This dollar amount represents the charge for NTD students taking classes in CLA at the CLA specific rate per credit hour. These CLA classes yield a faculty requirement of 0.25 FTE starting in Year 3 and forward provided that no seats are available in existing class sections. Year 1 and Year 2 require a lesser faculty FTE requirement based on the years in which these classes occur. The 0.25 FTE is calculated as follows (10 incremental students x 6 classes = 60 seats; 60 seats / 30 seat average class size = 2 classes; 2 classes / 8 classes per year for lecturer faculty member = 0.25 FTE).
Table 2 below shows the projected revenue for each of the first five years of the program. Again, this assumes an enrollment of 12 students per year, with 10 persisting into the second year for a total of 22 students. We anticipate 9 of the 10 persisting students will continue into the third year for a total of 31 students in the fall semester of the third year. Because 9 students will complete the program after the fall semester of the third year, only 22 will be enrolled into the spring semester of the third year. These enrollment projections have been reviewed and approved by the Jim Miller, Senior VP of Enrollment Management and Career Services at RIT. Each year, 10 of the projected 12 incoming students will be new to NTID, resulting in incremental tuition revenue of $150,400 in Year 1 and $422,839 by Year 5. Projected revenue also includes Federal Appropriations which NTID uses to offset costs not covered by tuition.

Table 2 – Projected Revenue

Information and Computing Studies Department
Mobile Application Development Associate of Science Degree Program
Projected Revenue For The Proposed Program

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Fall Semester Enrollment</th>
<th>Total Spring Semester Enrollment</th>
<th>Total Students' Semesters of Enrollment</th>
<th>Incremental Students' Semesters of Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>AY16-17</td>
<td>12</td>
<td>12</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>AY17-18</td>
<td>22</td>
<td>22</td>
<td>44</td>
<td>40</td>
</tr>
<tr>
<td>AY18-19</td>
<td>31</td>
<td>31</td>
<td>53</td>
<td>49</td>
</tr>
<tr>
<td>AY19-20</td>
<td>31</td>
<td>31</td>
<td>53</td>
<td>49</td>
</tr>
<tr>
<td>AY20-21</td>
<td>31</td>
<td>31</td>
<td>53</td>
<td>49</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester Tuition Rate</th>
<th>$7,520</th>
<th>$7,783</th>
<th>$8,056</th>
<th>$8,338</th>
<th>$8,629</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Total NTID Tuition Revenue</th>
<th>Incremental NTID Tuition Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>AY16-17</td>
<td>$180,460</td>
<td>$150,400</td>
</tr>
<tr>
<td>AY17-18</td>
<td>$342,461</td>
<td>$311,320</td>
</tr>
<tr>
<td>AY18-19</td>
<td>$426,947</td>
<td>$394,725</td>
</tr>
<tr>
<td>AY19-20</td>
<td>$441,891</td>
<td>$406,540</td>
</tr>
<tr>
<td>AY20-21</td>
<td>$457,357</td>
<td>$422,639</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>State Revenue</th>
<th>Federal Appropriation</th>
<th>Federal Appropriation - Incremental</th>
</tr>
</thead>
<tbody>
<tr>
<td>AY16-17</td>
<td>$0</td>
<td>$213,020</td>
<td>$213,020</td>
</tr>
<tr>
<td>AY17-18</td>
<td>$0</td>
<td>$311,320</td>
<td>$311,320</td>
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<tr>
<td>AY18-19</td>
<td>$0</td>
<td>$394,725</td>
<td>$394,725</td>
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<tr>
<td>AY19-20</td>
<td>$0</td>
<td>$406,540</td>
<td>$406,540</td>
</tr>
<tr>
<td>AY20-21</td>
<td>$0</td>
<td>$422,639</td>
<td>$422,639</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Grand Total Revenue</th>
<th>Incremental Grand Total Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>AY16-17</td>
<td>$383,500</td>
<td>$150,400</td>
</tr>
<tr>
<td>AY17-18</td>
<td>$530,200</td>
<td>$311,320</td>
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<tr>
<td>AY18-19</td>
<td>$657,200</td>
<td>$394,725</td>
</tr>
<tr>
<td>AY19-20</td>
<td>$566,700</td>
<td>$406,540</td>
</tr>
<tr>
<td>AY20-21</td>
<td>$656,500</td>
<td>$422,639</td>
</tr>
</tbody>
</table>

* Total students are all NTID students who will participate in this new program; this includes some existing NTID students, but mostly incremental students. Incremental students are students who will attend NTID specifically to participate in this new program. Therefore, total student enrollment and tuition revenue are projected to be greater than incremental student enrollment and tuition revenue.

* Both Federal Appropriation amounts include the amount calculated as additional salary and benefit costs to NTID for hiring 1.0 FTE Lecturer for the home department starting in Year 2 to cover department courses which would have previously been taught by faculty teaching in this new program.

* The Federal Appropriation increased by the amount the NTID Tuition Revenue decreased under the Incremental Student Scenario.
Table 3 shows the projected capital expenditures. A Mobile Application Development lab is part of the space design for pending move of the ICS department from the Carey building to the LBJ building. Because the lab and the facilities for the lab are already included as part of the design, equipment, and facilities costs, there are no projected capital expenditures. (See letter of support in Appendix E from Erwin Smith, Assistant Vice President for Information Technology and College Operations dated 10/24/2014).

Table 3 – Projected Capital Expenditures

Information and Computing Studies Department
Mobile Application Development Associate of Applied Science Degree
Projected Capital Expenditures

Table 3

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AY16-17</td>
<td>AY17-18</td>
<td>AY18-19</td>
<td>AY19-20</td>
<td>AY20-21</td>
</tr>
<tr>
<td>Capital Facilities</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Equipment</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total Capital Expenditures</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>

Additional equipment to support this program is not required. As with all programs there will be needs for existing equipment to be upgraded as technology develops. This expense will be supported through existing NTID policies and funded through current operating budgets.

New facilities, such as laboratories, will not be required for this program.
Table 4 shows a summary of the program expenditures, revenue and resource requirements for the new Mobile Application Development program.

Table 4 – Summary of Program Expenditures, revenue and Resource Requirements

<table>
<thead>
<tr>
<th>Information and Computing Studies Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Application Development Associate of Applied Science Degree Program</td>
</tr>
<tr>
<td>Summary of Program Expenditures, Revenue, and Resource Requirements</td>
</tr>
</tbody>
</table>

Table 4

<table>
<thead>
<tr>
<th>Table 4 – Summary of Program Expenditures, Revenue, and Resource Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personnel</strong></td>
</tr>
<tr>
<td>Personnel</td>
</tr>
<tr>
<td>Benefits</td>
</tr>
</tbody>
</table>

Additional Salary & Benefits for 1.0 FTE Lecturer. This hire is required by the home department to teach other department courses (translated to this new program) starting in year 2 (2017-2018) which previously would have been taught by faculty teaching in this new program.

<table>
<thead>
<tr>
<th>Additional Salary &amp; Benefits for 1.0 FTE Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>$80,000</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Charges</td>
</tr>
<tr>
<td>Instructional Supplies</td>
</tr>
<tr>
<td>Telephone</td>
</tr>
<tr>
<td>Software Licenses</td>
</tr>
<tr>
<td>Travel-Conferences</td>
</tr>
<tr>
<td>Tuition Payments for RIT Credits</td>
</tr>
<tr>
<td>Total Expense</td>
</tr>
<tr>
<td>Overhead (RIT Indirect Costs)</td>
</tr>
<tr>
<td>Total Expenses</td>
</tr>
<tr>
<td>Enrollment</td>
</tr>
<tr>
<td>Tuition</td>
</tr>
<tr>
<td>Federal Appropriation</td>
</tr>
<tr>
<td>Total Revenue</td>
</tr>
<tr>
<td>Total Rev. – Total Exp.</td>
</tr>
</tbody>
</table>

* Reviewed by RIT Enrollment Management & Career Services (Jim Miller)

* These numbers are based on total projected students for this program (which is shown here on the enrollment line). As shown on Table 2 – Projected Revenue for the Proposed Program, incremental students’ semesters of enrollment is slightly less than total students’ semesters of enrollment. Consequently, incremental students’ NTID tuition revenue is less than total students’ NTID tuition revenue. Also as shown on Table 2, grand total revenue and incremental grand total revenue are the same amount. This is as a result of the flexibility that NTID has to utilize its Federal Appropriation. Therefore, utilizing these total student amounts on Table 4 instead of utilizing the slightly lesser incremental amounts is considered inconsequential as it relates to this analysis.

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