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| S:\Communications\Logos and photos\SDBORLogos\final_sdbor_webreadyBW_trans.gif | **SOUTH DAKOTA BOARD OF REGENTS**ACADEMIC AFFAIRS FORMS |
| New Baccalaureate Degree Minor |
|  |  |

|  |  |
| --- | --- |
| **UNIVERSITY:** | DSU |
| **TITLE OF PROPOSED MINOR:** | Artificial Intelligence and Machine Learning |
| **DEGREE(S) IN WHICH MINOR MAY BE EARNED:** | Computer Science |
| **EXISTING RELATED MAJORS OR MINORS:** | None |
| **INTENDED DATE OF IMPLEMENTATION:** | Fall 2020  |
| **PROPOSED CIP CODE:** | 11.0102 |
| **UNIVERSITY DEPARTMENT:** | DCSC |
| **UNIVERSITY DIVISION:** | The Beacom College of Computer and Cyber Sciences |

[x] **Please check this box to confirm that:**

* The individual preparing this request has read [AAC Guideline 2.8](https://www.sdbor.edu/administrative-offices/academics/academic-affairs-guidelines/Documents/2_Guidelines/2_8_Guideline.pdf), which pertains to new baccalaureate degree minor requests, and that this request meets the requirements outlined in the guidelines.
* This request will not be posted to the university website for review of the Academic Affairs Committee until it is approved by the Executive Director and Chief Academic Officer.

**University Approval**

*To the Board of Regents and the Executive Director: I certify that I have read this proposal, that I believe it to be accurate, and that it has been evaluated and approved as provided by university policy.*

|  |  |  |
| --- | --- | --- |
|  |  | 4/16/2020 |
| President of the University |  | Date |

|  |
| --- |
|  |

Note: In the responses below, references to external sources, including data sources, should be documented with a footnote (including web addresses where applicable).

|  |
| --- |
|[x]   |[ ]
| *Yes* |  | *No* |

1. **Do you have a major in this field (*place an “X” in the appropriate box*)?**

DSU has four majors in this “field”: Computer Science, Cyber Operations, Network Security and Administration, and Computer Game Design. This proposed minor stands up as a technical variant within the broader discipline.

1. **If you do not have a major in this field, explain how the proposed minor relates to your university mission and strategic plan, and to the current Board of Regents Strategic Plan 2014-2020.**

*Links to the applicable State statute, Board Policy, and the Board of Regents Strategic Plan are listed below for each campus.*

*DSU:* [*SDCL § 13-59*](https://sdlegislature.gov/Statutes/Codified_Laws/DisplayStatute.aspx?Type=Statute&Statute=13-59)[*BOR Policy 1:10:5*](https://www.sdbor.edu/policy/documents/1-10-5.pdf)

[*Board of Regents Strategic Plan 2014-2020*](https://www.sdbor.edu/the-board/agendaitems/Documents/2014/October/16_BOR1014.pdf.)

The proposed minor in Artificial Intelligence is closely related to Computer Science and has important implications for Cybersecurity and Network Security and Administration majors.

1. **What is the nature/purpose of the proposed minor? Please include a brief (1-2 sentence) description of the academic field in this program.**Machine Learning is the learning in which a machine can learn by its own without being explicitly programmed. It is an application of Artificial Intelligence that provides the system the ability to automatically learn and improve from experience. Artificial Intelligence is the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.
2. **How will the proposed minor benefit students?**Artificial Intelligence (AI) and Machine Learning (ML) are expanding rapidly because of the substantial need to translate data into meaningful form used in business applications and decision making in society. Artificial Intelligence, in general, is aimed at building machines and computers that can enhance logical operations. AI systems execute tasks naturally associated with human intelligence, like speech recognition, decision-making, visual perception, and translating languages. Based on the need to have “smart” devices, machine learning provides algorithms which can be trained to perform a task. Students benefit from studying AI and ML because of the modern trend to have excessively huge amounts of data that need to be shaped and made functional. Students also benefit because machine learning has changed the way different industries work and how people function in those environments, e.g., healthcare, transportation, communication, retail, and entertainment.
3. **Describe the workforce demand for graduates in related fields, including national demand and demand within South Dakota.** *Provide data and examples; data sources may include but are not limited to the South Dakota Department of Labor, the US Bureau of Labor Statistics, Regental system dashboards, etc. Please cite any sources in a footnote.* Workforce demand for Computer and Information Research Scientists, e.g.

Computer Science major with minor in Artificial Intelligence, is projected to grow 19 percent from 2016 to 2026, much faster than the average for all occupations. The median annual wage for computer and information research scientists was $118,370 in May 2018. Computer scientists are likely to enjoy excellent job prospects, because many companies report difficulties finding these highly skilled workers.[[1]](#footnote-1) Workforce demand for Software Developers, e.g., Computer Science major with minor in Artificial Intelligence, show a median annual wage at $110,000 in May 2018. Employment of software developers is projected to grow 24 percent from 2016 to 2026, much faster than the average for all occupations. Software developers will be needed to respond to an increased demand for computer software.[[2]](#footnote-2) A third example of workforce demand for graduates is a Computer and Information Systems Manager. Employment of computer and information systems managers is projected to grow 12 percent from 2016 to 2026, faster than the average for all occupations. Demand for computer and information systems managers will grow as firms increasingly expand their business to digital platforms. The median annual wage for computer and information systems managers was $142,530 in May 2018.[[3]](#footnote-3)
4. **Provide estimated enrollments and completions in the table below and explain the methodology used in developing the estimates (*replace “XX” in the table with the appropriate year*).**

|  |  |
| --- | --- |
|  | **Fiscal Years\*** |
|  | **1st** | **2nd** | **3rd** | **4th** |
| *Estimates* | **FY 21** | **FY 22** | **FY 23** | **FY 24** |
| **Students enrolled in the minor (fall)** | 10 | 20 | 30 | 40 |
| **Completions by graduates** | 5 | 15 | 25 | 35 |

\*Do not include current fiscal year.

1. **What is the rationale for the curriculum? Demonstrate/provide evidence that the curriculum is consistent with current national standards.** There are many studies showing the rapid increase in computer-data systems-machine learning applications across society. We offer a few examples from a survey publication[[4]](#footnote-4) showing the complexity and dynamicity in the marketplace. Components of a rationale:
	1. Products and services are increasingly complex, endowing them with a significant information component;
	2. There is a need to manage increasing complexity in all societal elements;
	3. In a network, multiparty cooperative relationships and high degrees of flexibility are the keys. Control of the processes must be flexible enough to account both for the dynamicity of the market, and for perturbations to the process and even major disruptions;
	4. Market places are increasingly competitive, and the rate of innovation is rising.

We will continue to see the advancement of ML and AI-related technologies in 2019 and beyond. Companies such as Amazon, Apple, Facebook, Google, IBM and Microsoft are investing in research and development of AI, which will benefit the ecosystem in bringing AI closer to consumers. More Specifically, there are critically important trends requiring well-trained graduates in machine learning and artificial intelligence:[[5]](#footnote-5)

1. The rise of AI enabled chips
2. Convergence of the Internet of Things with Artificial Intelligence
3. Developing neural networks requires common models across multiple frameworks
4. Automated machine learning is rapidly gaining prominence
5. As machine learning models are applied to the huge data sets being developed, IT operations transform from being reactive to predictive.

The proposed curriculum is critically important to the education and training of modern graduates in computer and cyber sciences.

1. **Complete the tables below. Explain any exceptions to Board policy requested.**

 *Minors by design are limited in the number of credit hours required for completion. Minors typically consist of eighteen (18) credit hours, including prerequisite courses. In addition, minors typically involve existing courses. If the curriculum consists of more than eighteen (18) credit hours (including prerequisites) or new courses, please provide explanation and justification below.*

1. **Distribution of Credit Hours**

|  |  |  |
| --- | --- | --- |
| **[Insert title of proposed minor]** | **Credit Hours** | **Percent** |
| Requirements in minor | 9 | 50% |
| Electives in minor | 9 | 50% |
| Total | 18 | 100% |

1. **Required Courses in the Minor**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Prefix** | **Number** | **Course Title***(add or delete rows as needed)* | **Prerequisites for Course***Include credits for prerequisites in subtotal below.* | **Credit Hours** | **New****(yes, no)** |
| CSC | 383 | Machine Learning Fundamentals | CSC 250 | 3 | No |
| CSC  | 447 | Artificial Intelligence | None | 3 | No |
| CSC | 402 | Mathematical Foundations for AI | CSC 250, MATH 123 and MATH 281 | 3 | No |
|  |  |  | Subtotal | 9 | No |

1. **Elective Courses in the Minor:** **List courses available as electives in the program. Indicate any proposed new courses added specifically for the minor.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Prefix** | **Number** | **Course Title***(add or delete rows as needed)* | **Prerequisites for Course***Include credits for prerequisites in subtotal below.* | **Credit Hours** | **New****(yes, no)** |
| CIS | 368 | Predictive Analytics | CSC 150 and BADM 220 or MATH 281 | 3 | No |
| CIS | 372 | Programming for Analytics | CSC 150 | 3 | No |
| CSC | 457 | Generative Deep Learning | CSC 383 | 3 | Yes |
| CSC | 458 | Reinforcement Learning | CSC 383 | 3 | Yes |
|  |  |  | Subtotal | 9 |  |



1. **What are** **the learning outcomes expected for all students who complete the minor? How will students achieve these outcomes?** *Complete the table below to list specific learning outcomes—knowledge and competencies—for courses in the proposed program in each row. Label each column heading with a course prefix and number. Indicate required courses with an asterisk (\*). Indicate with an X in the corresponding table cell for any student outcomes that will be met by the courses included. All students should acquire the program knowledge and competencies regardless of the electives selected. Modify the table as necessary to provide the requested information for the proposed program.*

|  |
| --- |
| \*Required course |
| Individual Student Outcome(Same as in the text of the proposal) | Prefix & Number | Prefix & Number | Prefix & Number | Prefix & Number |
| Demonstrate competency programming in languages such as Prolog or LISP, understand knowledge representation and how to construct search algorithms. | CSC 447\* |  |  |  |
| Students will understand the fundamentals of machine learning, e.g., decision trees, artificial neural networks, Bayesian learning, genetic algorithms, support vector systems, and case-based learning | CSC 383\* |  |  |  |
| Students will master fundamental mathematical and computational objectives and knowledge units necessary for a student to successfully study artificial intelligence and machine learning, including partial derivatives, optimization, probability theory, linear algebra, principal component analysis, Markov chains, information theory, Bayes theory, iterative techniques, and Monte Carlo simulations | CSC 402\* |  |  |  |
| Students will understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving | CSC 383\* | CSC 457 |  | CIS 372 |
| Students will develop the ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems | CSC 447\* | CSC 383\* | CSC 402\* | CIS 368 |
| Students will develop the ability to carry out independent (or in a small group) research and communicate it effectively in a seminar setting | CSC 447\* | CSC 383\* | CSC 402\* | CSC 457  |
| Students will demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information | CSC 447\* | CSC 383\* | CSC 402\* | CSC 458 |

#### *Modify the table as necessary to include all student outcomes. Outcomes in this table are to be the same ones identified in the text.*

1. **What instructional approaches and technologies will instructors use to teach courses in the minor?** *This refers to the instructional technologies and approaches used to teach courses and NOT the technology applications and approaches expected of students.*

Lectures and readings will be used to highlight course content. Online quizzing is used to prepare students for section tests. Key points will be emphasized via cases, discussions, and assignments that incorporate technology. Student will utilize the internet and Library database for research. Projects require students to apply concepts from the course, solving relevant project management problems.

1. **Delivery Location**

 *Note: The accreditation requirements of the Higher Learning Commission (HLC) require Board approval for a university to offer programs off-campus and through distance delivery.*

1. **Complete the following charts to indicate if the university seeks authorization to deliver the entire program on campus, at any off campus location (e.g., UC Sioux Falls, Capital University Center, Black Hills State University-Rapid City, etc.) or deliver the entire program through distance technology (e.g., as an online program)?**

|  |  |  |
| --- | --- | --- |
|  | **Yes/No** | ***Intended Start Date*** |
| **On campus** | Yes | **Fall 2020**  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Yes/No** | ***If Yes, list location(s)*** | ***Intended Start Date*** |
| **Off campus** | Choose an item. |  | Choose an item.Choose an item. |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Yes/No** | ***If Yes, identify delivery methods****Delivery methods are defined in* [*AAC Guideline 5.5*](https://www.sdbor.edu/administrative-offices/academics/academic-affairs-guidelines/Documents/5_Guidelines/5_5_Guideline.pdf)*.* | ***Intended Start Date*** |
| **Distance Delivery (online/other distance delivery methods)** | Yes |  | **Fall 2020**  |
| **Does another BOR institution already have authorization to offer the program online?** | No | **If yes, identify institutions:**  |

1. **Complete the following chart to indicate if the university seeks authorization to deliver more than 50% but less than 100% of the minor through distance learning (e.g., as an online program)?** *This question responds to HLC definitions for distance delivery.*

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Yes/No** | ***If Yes, identify delivery methods*** | ***Intended Start Date*** |
| **Distance Delivery (online/other distance delivery methods)** | Choose an item. |  | Choose an item.Choose an item. |

1. **Does the University request any exceptions to any Board policy for this minor? Explain any requests for exceptions to Board Policy.** *If not requesting any exceptions, enter “None.”*

No

1. **Cost, Budget, and Resources: Explain the amount and source(s) of any one-time and continuing investments in personnel, professional development, release time, time redirected from other assignments, instructional technology & software, other operations and maintenance, facilities, etc., needed to implement the proposed minor.** *Address off-campus or distance delivery separately.*

Two new courses are part of this minor, however, those courses are being added to the BS in Computer Science major. These two courses will not add costs to this program.

1. **New Course Approval: New courses required to implement the new minor may receive approval in conjunction with program approval or receive approval separately. Please check the appropriate statement (*place an “X” in the appropriate box*).**

|  |
| --- |
|[x]  YES,  |

*the university is seeking approval of new courses related to the proposed program in conjunction with program approval. All New Course Request forms are included as Appendix C and match those described in section 7.*

|  |
| --- |
|[ ]  NO,  |

*the university is not seeking approval of all new courses related to the proposed program in conjunction with program approval; the institution will submit new course approval requests separately or at a later date in accordance with Academic Affairs Guidelines.*

**Appendix C New Courses**

|  |  |
| --- | --- |
|  |  |
| S:\Communications\Logos and photos\SDBORLogos\final_sdbor_webreadyBW_trans.gif | **SOUTH DAKOTA BOARD OF REGENTS**ACADEMIC AFFAIRS FORMS |
| New Course Request |
|  |  |

Use this form to request a new common or unique course. Consult the system database through Colleague or the [Course Inventory Report](http://apps.sdbor.edu/ris-reporting/CourseInventoryOptions.cfm) for information about existing courses before submitting this form.

|  |  |  |
| --- | --- | --- |
| DSU |  | **The Beacom College of Computer and Cyber Sciences** |
| **Institution** |  | **Division/Department** |
|  |  | 4/1/2020 |
| **Institutional Approval Signature** |  | **Date** |

|  |
| --- |
|  |

**Section 1. Course Title and Description**

If the course contains a lecture and laboratory component, identify both the lecture and laboratory numbers (xxx and xxxL) and credit hours associated with each. Provide the complete description as you wish it to appear in the system database in Colleague and the [Course Inventory Report](http://apps.sdbor.edu/ris-reporting/CourseInventoryOptions.cfm) including pre-requisites, co-requisites, and registration restrictions.

|  |  |  |
| --- | --- | --- |
| **Prefix & No.** | **Course Title** | **Credits** |
| CSC 457/557 | Generative Deep Learning | 3 |

*NOTE: The Enrollment Services Center assigns the short, abbreviated course title that appears on transcripts. The short title is limited to 30 characters (including spaces); meaningful but concise titles are encouraged due to space limitations in Colleague.*

|  |  |
| --- | --- |
| **Course Description** |  |
| Desc: This course aims to discover how to re-create some of the most impressive examples of generative deep learning models, such as variational auto-encoders, generative adversarial networks (GANs), encoder-decoder models, and world models. It also aims to explore GANs to study important real-world applications, including image/video manipulation and generation, offense attacks and countermeasures, risk and recovery in healthcare and pharmacology, and so on. |

*NOTE: Course descriptions are short, concise summaries that typically do not exceed 75 words. DO: Address the content of the course and write descriptions using active verbs (e.g., explore, learn, develop, etc.). DO NOT: Repeat the title of the course, layout the syllabus, use pronouns such as “we” and “you,” or rely on specialized jargon, vague phrases, or clichés.*

**Pre-requisites or Co-requisites (add lines as needed)**

|  |  |  |
| --- | --- | --- |
| **Prefix & No.** | **Course Title** | **Pre-Req/Co-Req?** |
| CSC 383 | Machine Learning Fundamentals | Prereq |
|  |  |  |

**Registration Restrictions**

|  |
| --- |
| None |

**Section 2. Review of Course**

1. **Was the course first offered as an experimental course (*place an “X” in the appropriate box*)?**

|  |  |
| --- | --- |
|[ ]  Yes *(if yes, provide the course information below)* |[x]  No |

1. **Will this be a unique or common course (*place an “X” in the appropriate box*)?**

*If the request is for a unique course, verify that you have reviewed the common course catalog via Colleague and the system* [*Course Inventory Report*](http://apps.sdbor.edu/ris-reporting/CourseInventoryOptions.cfm) *to determine if a comparable common course already exists. List the two closest course matches in the common course catalog and provide a brief narrative explaining why the proposed course differs from those listed. If a search of the common course catalog determines an existing common course exists, complete the Authority to Offer an Existing Course Form.*

|  |
| --- |
|[x]  **Unique Course** |

|  |  |  |
| --- | --- | --- |
| **Prefix & No.** | **Course Title** | **Credits** |
| CSC 449/549 | Advanced Topics in Artificial Intelligence (SDSMT) | 3 |
| CSC 448/548 | Machine Learning (SDSMT) | 3 |
| *Provide explanation of differences between proposed course and existing system catalog courses below:* |
| The proposed CSC 457 course builds on the broad foundation of CSC 447, which is a common course. The CSC 449 class is a broad course with various possible topics that will differ each offering. The proposed course is designed with a specific purpose, which is to introduce the generative learning, a novel and emerging topic in deep learning. While SDSMT’s CSC 449 offer multiple topics (below) in AI. DSU’s CSC 457 mainly introduces 1) variational autoencoders can change facial expressions in photos, 2) practical GAN examples for image and video creation and manipulation, 3) recurrent generative models for text generation. In sum, CSC 457 presents the most recent achievements in AI, and it plays a necessary role in a collection of courses.The CSC 448 class more closely relates to the DSU course CSC 483 and addresses a different facet of the field. CSC 449: This course will cover advanced topics in artificial intelligence, such as: pattern recognition, neural networks, computational neuroscience, evolutionary computing, immunocomputing, swarm intelligence, machine learning, Markov decision processes, reinforcement learning, probabilistic reasoning, fuzzy logic, expert systems, and intelligent agents. Prereq: MATH 225(CalcIII) and CSC 315(Data Structures)CSC 448: A systematic study of the theory and algorithms that constitute machine learning. It covers learning based on examples including genetic algorithms, case-based reasoning, decision trees, and Bayesian methods. Prereq: CSC 315 (Data Structures) |

|  |  |
| --- | --- |
|[ ]  **Common Course** | *Indicate universities that are proposing this common course:* |
|  |  |  |
|  |[ ]  BHSU |[ ]  DSU |[ ]  NSU |[ ]  SDSMT | [ ]  | SDSU |[ ]  USD |

**Section 3. Other Course Information**

1. **Are there instructional staffing impacts?**

|  |  |
| --- | --- |
|[ ]  **No**. Replacement of  |  |
|  |  | (course prefix, course number, name of course, credits) |
|  |  | \*Attach course deletion form |
|  |  |  |
| Effective date of deletion: | Click here to enter a date. |  |
|[x]  **No**. Schedule Management, explain below: Faculty on staff (O’Brien, Xu, Abassi) will cover the courses on a rotation with other courses. |
|[ ]  **Yes**. Specify below:  |

1. **Existing program(s) in which course will be offered**: BS in Computer Science; MS in Computer Science.
2. **Proposed instructional method by university**: Lecture
3. **Proposed delivery method by university**: 001, 015, 018
4. **Term change will be effective**: Fall 2020
5. **Can students repeat the course for additional credit?**

|  |  |  |  |
| --- | --- | --- | --- |
|[ ]  Yes, total credit limit: |  |  |[x]  No |

1. **Will grade for this course be limited to S/U (pass/fail)?**

|  |  |
| --- | --- |
|[ ]  Yes |[x]  No |

1. **Will section enrollment be capped?**

|  |  |  |  |
| --- | --- | --- | --- |
|[x]  Yes, max per section: | 25 |  |[ ]  No |

1. **Will this course equate (i.e., be considered the same course for degree completion) with any other unique or common courses in the common course system database in Colleague and the** [**Course Inventory Report**](http://apps.sdbor.edu/ris-reporting/CourseInventoryOptions.cfm)**?**

|  |  |
| --- | --- |
|[ ]  Yes |[x]  No |
| *If yes, indicate the course(s) to which the course will equate (add lines as needed):* |
|  |

|  |  |
| --- | --- |
| **Prefix & No.** | **Course Title** |
|  |  |

1. **Is this prefix approved for your university?**

|  |  |
| --- | --- |
|[x]  Yes |[ ]  No |
| *If no, provide a brief justification below:* |
|  |

**Section 4. Department and Course Codes (Completed by University Academic Affairs)**

|  |  |
| --- | --- |
| 1. **University Department Code:**
 | DCSC |

|  |  |
| --- | --- |
| 1. **Proposed** [**CIP Code**](http://nces.ed.gov/ipeds/cipcode/default.aspx?y=55)**:**
 | 11.0201 |
|  |  |
| *Is this a new CIP code for the university?* |[ ]  Yes |[x]  No |

|  |  |
| --- | --- |
|  |  |
| S:\Communications\Logos and photos\SDBORLogos\final_sdbor_webreadyBW_trans.gif | **SOUTH DAKOTA BOARD OF REGENTS**ACADEMIC AFFAIRS FORMS |
| New Course Request |
|  |  |

Use this form to request a new common or unique course. Consult the system database through Colleague or the [Course Inventory Report](http://apps.sdbor.edu/ris-reporting/CourseInventoryOptions.cfm) for information about existing courses before submitting this form.

|  |  |  |
| --- | --- | --- |
| DSU |  | **The Beacom College of Computer and Cyber Sciences** |
| **Institution** |  | **Division/Department** |
|  |  | 4/16/2020 |
| **Institutional Approval Signature** |  | **Date** |

|  |
| --- |
|  |

**Section 1. Course Title and Description**

If the course contains a lecture and laboratory component, identify both the lecture and laboratory numbers (xxx and xxxL) and credit hours associated with each. Provide the complete description as you wish it to appear in the system database in Colleague and the [Course Inventory Report](http://apps.sdbor.edu/ris-reporting/CourseInventoryOptions.cfm) including pre-requisites, co-requisites, and registration restrictions.

|  |  |  |
| --- | --- | --- |
| **Prefix & No.** | **Course Title** | **Credits** |
| CSC 458/558 | Reinforcement Learning | 3 |

*NOTE: The Enrollment Services Center assigns the short, abbreviated course title that appears on transcripts. The short title is limited to 30 characters (including spaces); meaningful but concise titles are encouraged due to space limitations in Colleague.*

|  |  |
| --- | --- |
| **Course Description** |  |
| This course will cover the topic of Reinforcement Learning with a focus on application and projects. Students will review the different algorithms and applicable data structures available in this field. Following the review, a wide range of scenarios where Reinforcement Learning can be applied will be explored and analyzed in order to give students the ability identify these situations in the real world and apply their knowledge. |

*NOTE: Course descriptions are short, concise summaries that typically do not exceed 75 words. DO: Address the content of the course and write descriptions using active verbs (e.g., explore, learn, develop, etc.). DO NOT: Repeat the title of the course, layout the syllabus, use pronouns such as “we” and “you,” or rely on specialized jargon, vague phrases, or clichés.*

**Pre-requisites or Co-requisites (add lines as needed)**

|  |  |  |
| --- | --- | --- |
| **Prefix & No.** | **Course Title** | **Pre-Req/Co-Req?** |
| CSC 383 | Machine Learning Fundamentals | Prereq |
| CSC 402 | Mathematical Foundations of AI | Prereq |

**Registration Restrictions**

|  |
| --- |
| None |

**Section 2. Review of Course**

1. **Was the course first offered as an experimental course (*place an “X” in the appropriate box*)?**

|  |  |
| --- | --- |
|[ ]  Yes *(if yes, provide the course information below)* |[x]  No |

1. **Will this be a unique or common course (*place an “X” in the appropriate box*)?**

*If the request is for a unique course, verify that you have reviewed the common course catalog via Colleague and the system* [*Course Inventory Report*](http://apps.sdbor.edu/ris-reporting/CourseInventoryOptions.cfm) *to determine if a comparable common course already exists. List the two closest course matches in the common course catalog and provide a brief narrative explaining why the proposed course differs from those listed. If a search of the common course catalog determines an existing common course exists, complete the Authority to Offer an Existing Course Form.*

|  |
| --- |
|[x]  **Unique Course** |

|  |  |  |
| --- | --- | --- |
| **Prefix & No.** | **Course Title** | **Credits** |
| CSC 449/549 | Advanced Topics in Artificial Intelligence (SDSMT) | 3 |
| CSC 448/548 | Machine Learning (SDSMT) | 3 |
| *Provide explanation of differences between proposed course and existing system catalog courses below:* |
| The proposed CSC 458 course builds on the broad foundation of CSC 447, which is a common course. The CSC 449 class is a broad course with various possible topics that will differ each offering. The proposed course is designed with a specific purpose and plays a necessary role in a collection of courses.The CSC 448 class more closely relates to the DSU course CSC 483 and addresses a different facet of the field. CSC 449: This course will cover advanced topics in artificial intelligence, such as: pattern recognition, neural networks, computational neuroscience, evolutionary computing, immunocomputing, swarm intelligence, machine learning, Markov decision processes, reinforcement learning, probabilistic reasoning, fuzzy logic, expert systems, and intelligent agents. Prereq: MATH 225(CalcIII) and CSC 315(Data Structures)CSC 448: A systematic study of the theory and algorithms that constitute machine learning. It covers learning based on examples including genetic algorithms, case-based reasoning, decision trees, and Bayesian methods. Prereq: CSC 315 (Data Structures) |

|  |  |
| --- | --- |
|[ ]  **Common Course** | *Indicate universities that are proposing this common course:* |
|  |  |  |
|  |[ ]  BHSU |[ ]  DSU |[ ]  NSU |[ ]  SDSMT | [ ]  | SDSU |[ ]  USD |

**Section 3. Other Course Information**

1. **Are there instructional staffing impacts?**

|  |  |
| --- | --- |
|[ ]  **No**. Replacement of  |  |
|  |  | (course prefix, course number, name of course, credits) |
|  |  | \*Attach course deletion form |
|  |  |  |
| Effective date of deletion: | Click here to enter a date. |  |
|[x]  **No**. Schedule Management, explain below: Faculty on staff ( O’Brien, Xu, Abassi ) will cover the courses. |
|[ ]  **Yes**. Specify below:  |

1. **Existing program(s) in which course will be offered**: BS in Computer Science; MS in Computer Science.
2. **Proposed instructional method by university**: Lecture
3. **Proposed delivery method by university**: 001, 015, 018
4. **Term change will be effective**: Fall 2020
5. **Can students repeat the course for additional credit?**

|  |  |  |  |
| --- | --- | --- | --- |
|[ ]  Yes, total credit limit: |  |  |[x]  No |

1. **Will grade for this course be limited to S/U (pass/fail)?**

|  |  |
| --- | --- |
|[ ]  Yes |[x]  No |

1. **Will section enrollment be capped?**

|  |  |  |  |
| --- | --- | --- | --- |
|[x]  Yes, max per section: | 25 |  |[ ]  No |

1. **Will this course equate (i.e., be considered the same course for degree completion) with any other unique or common courses in the common course system database in Colleague and the** [**Course Inventory Report**](http://apps.sdbor.edu/ris-reporting/CourseInventoryOptions.cfm)**?**

|  |  |
| --- | --- |
|[ ]  Yes |[x]  No |
| *If yes, indicate the course(s) to which the course will equate (add lines as needed):* |
|  |

|  |  |
| --- | --- |
| **Prefix & No.** | **Course Title** |
|  |  |

1. **Is this prefix approved for your university?**

|  |  |
| --- | --- |
|[x]  Yes |[ ]  No |
| *If no, provide a brief justification below:* |
|  |

**Section 4. Department and Course Codes (Completed by University Academic Affairs)**

|  |  |
| --- | --- |
| 1. **University Department Code:**
 | DCSC |
| 1. **Proposed** [**CIP Code**](http://nces.ed.gov/ipeds/cipcode/default.aspx?y=55)**:**
 | 11.0201 |
|  |  |
| *Is this a new CIP code for the university?* |[ ]  Yes |[x]  No |

1. <https://www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm> [↑](#footnote-ref-1)
2. <https://www.bls.gov/ooh/computer-and-information-technology/software-developers.htm> [↑](#footnote-ref-2)
3. <https://www.bls.gov/ooh/management/computer-and-information-systems-managers.htm> [↑](#footnote-ref-3)
4. Macintosh A (1997) Position paper on knowledge asset management. Artificial Intelligence Applications Institute (AIAI), Edinburgh [↑](#footnote-ref-4)
5. <https://www.forbes.com/sites/janakirammsv/2018/12/09/5-artificial-intelligence-trends-to-watch-out-for-in-2019/#27f841185618> [↑](#footnote-ref-5)