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Collection Development Policy

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| Kristy Davis | NRAO | 05/28/2020 |

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I INTRODUCTION

I.1 Purpose

The policy is intended to guide NRAO Library staff and inform other NRAO staff and the wider astronomy community of NRAO Library standards for selecting material (accessions), removing materials (deaccessioning), sharing, or purchasing materials. It may also serve as the basis for cooperative collection agreements with other astronomy libraries, e.g., AURA-affiliates, NASA, LISA network, UVA, etc. The policy guides library staff on how to plan for budgeting and space.

I.2 Audience

The NRAO Library serves all NRAO staff and a number of external communities, with an emphasis on these user groups:

- Research astronomers and scientists
 - Early career/postdocs
 - Established astronomers and scientists
- Engineers (CDL, etc.) team
- Software engineers
- Business and administrative professionals
 - Human Resources
- NRAO Leadership
- Information Technology Services Division (ITSD) staff
- Data science personnel
- Science communications staff (Office of Education and Public Outreach)
- Optics and instrumentation personnel
- Interns and summer students
- Visitors
- ADS staff
- UVA staff, esp. Bloomberg Physics and Astronomy students and faculty
- Other astronomy libraries and their research staff, including USNO, Goddard, ESO, JPL, STSci, Carnegie Institute, and other AURA centers such as Gemini and NOAO
- More broadly, other libraries in the OCLC sharing network and their constituents.

I.3 About the Library

The National Radio Astronomy Observatory is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc. Founded in 1956, the NRAO provides state-of-the-art radio telescope facilities for use by the international scientific community. NRAO telescopes are open to all astronomers regardless of institutional or national affiliation. Observing time on NRAO telescopes is available on a competitive basis to qualified scientists after evaluation of research proposals on the basis of scientific merit, the capability of the instruments to do the work, and the availability of the telescope during the requested time. NRAO also provides both formal and informal programs in education and public outreach for teachers, students, the general public, and the media.

The library was founded in 1956 with the observatory, but without full space or funding. The initial collection was built from discarded University of Virginia and staff member texts. Some of these original

texts still remain. Library staff are actively engaged in deaccessioning, i.e., permanently removing, texts that no longer or never did fit the scope of NRAO research and administrative needs.

Purchasing decisions are intended to directly support the Observatory's mission and three strategic goals.

1.4 NRAO Mission

We help humanity explore the universe with advanced radio telescopes and ever-growing data archives.

1.5 NRAO Strategic Goals

Excel in the science operations of NRAO's current and future radio astronomy endeavors, and make the world's astronomical information accessible to all.

1.6 NRAO Pandemic Response

In response to the global Covid-19 pandemic and in accordance with state government instituted closures and stay-at-home orders, the National Radio Astronomy Observatory (NRAO) entered Infection Disease Operating Status (IDOS) on March 16, 2020. The NRAO Library ceased all on-site activities in compliance with the NRAO directive to work from home.

In April, NRAO began preparing policies and operating procedures for Staff to return to work, initially in a limited capacity in May and then a more regular manner in June. This document, effective June 1, 2020, outlines library policies and librarian procedures for maintaining social distancing and proper sanitation of library spaces and collections for the safe use of NRAO Staff through the duration of the pandemic.

1.7 Cooperative Agreements/Resource Sharing

The NRAO Library is a member of the worldwide OCLC WorldShare interlibrary loan community and reserves the right to pursue works suggested for purchase through interlibrary loan first in order to determine the appropriateness of the material for purchase. Typically, materials copyrighted more than five years ago will be pursued as an interlibrary loan, unless the material is the most recent work on a given topic and is highly relevant to the research and general interest areas that NRAO Library actively collects, as defined below. Earlier editions of works not currently owned by the NRAO Library will typically be borrowed via interlibrary loan, rather than purchased.

The NRAO Library is also a part of the PAMNet (Physics-Astronomy-Math (PAM) Division of the Special Libraries Association (SLA) and the "Astrolib" (Astronomy Libraries Worldwide) community that meets every three-four years for the Library and Information Services in Astronomy (LISA) conference. Resources – typically journal articles, observatory publications, and historic materials – may be pursued through these networks if purchase to article rights or a standard subscription is not economical, WorldShare interlibrary loan or UVA access is not an option, and/or the content falls outside the scope of NRAO's primary collection.

1.8 UVA Library Access

The NRAO Library and all Virginia NRAO staff have on-site access to the libraries on Grounds. All Virginia NRAO staff are eligible to borrow UVA materials that circulate, and can use nearly all UVA electronic resources such as databases and e-journals on site in the Astronomy or Alderman Library with a Virginia state ID. One major limitation is that most UVA-licensed eBooks remain unavailable for download due to publisher restrictions. Unlike most e-journals, the majority of eBooks can only be viewed on-site but not copied or downloaded. The NRAO Library and NRAO staff do not have the rights to use UVA-licensed e-resources off site, unless the staff member is also a UVA student or faculty member.

2 COLLECTION EVALUATION

2.1 General selection criteria

As a guideline, the NRAO Library typically purchases newer materials, defined as items published in the past five years, or earlier works that represent the most current monograph, i.e., book, available on a given topic. Examples of earlier works, which may still qualify as “current” despite being published 10+ years ago are core industry radio astronomy texts for which the earliest available edition is dated in the 1990s or early 2000s. Should a revised edition become available, the NRAO Library would purchase it, and likely remove the earlier text. See the **Subject Analysis** section below for an overview of the topical areas the NRAO Library collects.

The NRAO Library is actively pursuing an electronic collection in order to meet the needs of its satellite campuses, i.e., Socorro, NTC, and Green Bank, and an increasingly mobile workforce. Electronic versions of books and journals are also considered for the purpose of limiting physical shelf space and to allow for better return on investment in cases where a single electronic copy is accessible to two or more individuals simultaneously. This means, whenever available, the NRAO Library will first consider digital content, and then consider print if:

- a) The material is unavailable in a digital format;
- b) the individual, class, or research group requesting the material specifically asks for print;
- c) the text is narrative in nature as opposed to technical or research-oriented. Examples include biographies, socio-historical treatises on astronomy, career guides, etc.;
- d) the title is identified as a core text, as defined under **Reference Collection** or **Appendix A**. These titles are typically purchased in both print and electronic formats when available.

The library may elect to purchase both print and electronic for other scientific, technical, or popular titles depending on user demand and Observatory need. Examples of past purchases made in both formats include works on infrared spectroscopy, optics, or diversity and inclusion. Often these are works related to a class, training, or speaker series, or texts which are expected to remain highly relevant through the next decade (2020s).

2.2 Formats

2.2.1 *Audiovisual materials*

The NRAO Library retains a very selective collection of CDs, mainly containing astronomical data that the Observatory was instrumental in producing and publishing. These types of CDs are retained only if there is not a comparable product online.

The DVD collection is at a minimum and focuses on material produced by or about the Observatory. The Library is no longer actively purchasing DVDs because so much of this material remains accessible through popular streaming services, or interlibrary loan. Other audiovisual formats, such as microfilm,

microfiche, and floppy disks, have been removed from the collection since the library does not maintain hardware that will allow these formats to be read.

2.2.2 *Software*

The NRAO Library does not collect software.

2.2.3 *Newspapers*

NRAO Library staff can assist users with locating current and historical newspaper articles via the Virginia public library system's online databases as needed.

2.3 **Scope**

2.3.1 *Languages*

Current acquisitions focus on English language materials. Foreign language print periodicals and retrospective monographs are maintained on a case-by-case basis.

2.3.2 *Geographical coverage*

American (North and South) and European publications form the bulk of the collection with the inclusion of significant works from international or regional astronomical societies.

2.3.3 *Chronological coverage*

Subject history is covered at a basic study level; emphasis is placed on 20th and 21st century materials. "Core texts" (see Appendix A) are retained regardless of the date of publication and if removed are generally replaced by updated editions or similar, modern works.

2.3.4 *Current/retrospective coverage*

Acquisitions are almost entirely in current releases. Retrospective works are purchased/retained selectively to replace or maintain core texts, or at the request of research staff if the retrospective work cannot be obtained via interlibrary loan or the library's networks.

2.3.5 *Duplication*

Typically, the NRAO Library purchases single rather than multiple copies of print and electronic works. Duplicate print and digital copies will be maintained for core texts (see Appendix A), for core materials in satellite locations, and for content with significant NRAO authorship or subject treatment. With the exception of these cases, available electronic versions may be considered in lieu of, rather than as a supplement to, print access. In general, eBooks that are expected to be accessed by more than one staff member concurrently over the course of the 2020s (up-and-coming topics such as infrared spectroscopy, astrochemistry, advanced optics, systems engineering) may be purchased in sets of 3 user or unlimited user copies. The decision to purchase a single, multiple, or unlimited use digital copy is based on publisher pricing models, the library's budget, and user demand.

2.4 **Types of publications**

2.4.1 *Periodicals (electronic and print)*

If ALMA, VLA, VLBA, GBT, or other future mission data is shared via research within a journal, it is eligible for inclusion in NRAOPapers. Library staff must have access to full text content, and it must be posted to arXiv in order to assess whether articles belong.

A journal is appropriate for interlibrary loan only in cases where we can reasonably expect staff to request five or less articles from the most recent five years. This is in order to comply with copyright law and CONTU guidelines. For journals where the library expects to need five or more articles in recent years, on site access via another academic library such as UVA, or a direct subscription may be appropriate.

Adapting the NRAO Library policy, “electronic journal titles are intended to be actively weeded each year if the price per download rises above the threshold where article purchase on demand becomes more cost-effective.” The point at which article purchase on demand becomes cost-effective depends on each title, with cost per download ranging from \$20 to \$100+. Typically, the NRAO Library will not discontinue an electronic journal unless a downward trend in full text downloads continues for three or more years. In most cases, the library retains the rights to the years licensed in the past, but not future years; exact terms depend on publisher licensing.

The NRAO Library may pursue electronic “archive”, i.e., back file collections for high-use journals in order to remove physical volumes.

2.4.2 *Monographs (electronic and print)*

See **General selection criteria** and **Subject Analysis** sections.

2.4.3 *Textbooks*

Collected selectively to provide basic coverage of most astronomy and physics topics related to the missions NRAO operates.

2.4.4 *Conference proceedings*

Proceedings of key conference and society meetings are available primarily through electronic subscription. Print collections of proceedings are maintained for some influential series, such as the IAU Proceedings and Proceedings of the Astronomical Society of the Pacific (PASP), though the library will be actively removing most duplicate print copies of proceedings series.

- IAU (International Astronomical Union): 1928 – current online; duplicate print;
- AIP (American Institute of Physics) 1970 – current;
- ASP (Astronomical Society of the Pacific, i.e., PASP)
- SPIE (Proceedings of the SPIE): The entire SPIE Digital Library is accessible to NRAO staff, including Proceedings of the SPIE, SPIE eBooks, and other ad hoc conference proceedings.

2.4.5 *Popular works and biographies*

Collected at a basic level for the general interest of scientific staff; also meets the needs of non-scientific staff at the Observatory seeking to enhance their understanding of NRAO research.

2.4.6 *Dissertations*

The NRAO Library maintains a collection of print dissertations written by current or former staff if deposited, but is not actively adding to this collection. There is also a collection of dissertations requested for past purchase for research purposes.

2.5 Special collections

2.5.1 *NRAO publications*

Where possible, the NRAO Library collects the published and non-published (produced in-organization) works that are authored by NRAO staff, to which NRAO is a major contributor, or which discuss NRAO or its mission, and significantly in subject matter. This applies to technical, government, and scientific publications. Generally, only one copy of popular works about NRAO and/or its missions will be purchased because they remain available through the WorldShare interlibrary loan community in the event of loss or damage. Typically, one additional copy of NRAO-copyrighted technical, government, or scientific materials – with the exception of standard refereed journal articles – are also deposited with the NRAO Institutional Archive digitally and/or in print. Records, papers, photographs, technical reports, non-monographic, electronic publications, and other materials documenting the history of the Observatory are maintained separately by the NRAO Institutional Archive.

2.5.2 *Observatory publications*

The NRAO Library houses a unique mix of annual reports, newsletters, and observing manuals from observatories across the globe. We are actively working with the observatories and organizations that produced the materials to transition to online access while ensuring unique historical copies are preserved either in ADS, with the content creators, or at NRAO if necessary.

2.5.3 *Works using copyrighted NRAO images (ALMA, etc.)*

Officially, any publication that uses an NRAO-copyrighted image should be deposited with the NRAO Library. This was a policy determined by the Education and Public Outreach (EPO) and the NRAO Library in the 1990s. The NRAO Library does not actively pursue materials using NRAO copyrighted images, but depends on the author and publisher to adhere to the policy. Adherence to the policy is minimal and the collection represents only a small footprint of works using copyrighted NRAO images. Works that are sent for deposit, which fit our general collection criteria outlined below will be cataloged and put into circulation with the rest of the collection. Popular, esoteric, humorous, and other works that do not fit the overall selection criteria will not be cataloged but are available to browse in the library. This collection may eventually be removed in consultation with the Education and Public Outreach once the related policy is revised.

2.5.4 *Reference collection*

For ease of access, print books at the NRAO Library are almost exclusively circulating; however, the Library's small Reference collection is non-circulating. Typically, at least one print circulating copy of each reference title is available.

2.6 Deselection criteria and procedures

Deselection begins with a review of all materials that have not circulated in-house or outside the library in the previous five-year period. For example, if the year the library assesses is 2020, the library will run reports in the circulation module of its catalog to determine what has not circulated from 2015-2019. Items with limited use may also be evaluated for deselection. "Limited use" is defined as two or less circulations in a five-year period. Circulation is intended to mean documented use outside or inside the library.

The NRAO Library underwent a partial deaccessioning process in 2012-2017. The complete collection review is expected to last until 2022, with rotating review thereafter. Deselection is an important part of library service and allows library staff to actively pursue newer titles or editions and ensure its collection and the information therein remains timely, relevant, and accurate.

For titles that are revised regularly, the NRAO Library will make every effort to maintain the most recent edition, the second most recent edition, and the first edition (if already owned). However, the library will not remove a title that still appears to have relevance no matter how "old" it is or how infrequently it was checked out. Earlier texts are sometimes key to understanding prior research. In many cases, library staff look at metrics such as check outs, in-house use, ADS citations, and Google Scholar citations to understand the text's impact in the field. The library may also reach out to staff subject matter experts for their opinion when trying to assess a book's continued relevance and value to the Observatory.

There are a number of steps in deciding which titles can be removed and which should stay. The NRAO Library considers how many other libraries in the U.S. carry the book in print and where those libraries are located, since the Observatory cannot access other libraries' eBooks and rarely have access to international print materials. Assessing the quantity of print copies on the continent tells staff how likely it is to get a copy via interlibrary loan.

There are some titles or types of content that are generally considered ineligible for removal. The NRAO Library will not remove titles listed in the Core Collection without seeking out a replacement or updated edition.

Texts that are considered seminal to their respective subdisciplines or having historical significance to our understanding of the development of astronomy or a branch of astronomy may be retained even if they show infrequent use.

Any text related to astronomy (directly or indirectly) for which we are the only institution that carries a copy will typically be retained. The NRAO Library uses a five copy threshold to make decisions on retention. In most cases, we will contact the publishing institution and try to repatriate a rare historical astronomy text with the publisher, but there are times this is not possible and we may elect to retain one of the few copies in existence.

Any and all texts relating to the history of NRAO and its missions (past, current, or proposed) are retained in print unless an electronic version exists. In particular, those published solely or jointly by NRAO about VLA, EVLA, ngVLA, VLBA, GBT, ALMA etc. will remain in print. Any and all texts relating to other radio astronomy observatories and institutions (ESO, JAO, etc.) will be removed with caution. Most histories and information about non-NRAO observatories in book format will also be left alone or efforts will be made to send them to other libraries because there are few copies in existence.

General interest texts which do not "age out" in the same way technical and research titles do may not be subject to the five-year circulation rule, unless they are widely available via interlibrary loan. Examples include biographies, foundational mathematics, etc.

Electronic resources are typically not deaccessioned even when a newer edition becomes available because they do not take up physical shelf space in the library and require limited staff time and maintenance once added to the catalog. However, the library reserves the right to remove records for electronic resources if they are deemed outdated and have zero or low five-year circulation. Reporting tools, such as publisher-hosted administrator platforms and COUNTER statistics for electronic journals, may be used to determine the use of electronic resources.

Physical space is also a factor that affects the library's decision to assess the collection and remove older or duplicate content. In cases where one can reasonably expect content will remain accessible online – either because the library purchased rights to the content or because the content is maintained by a

learned society such as the IAU or AAS at low or no cost – the library may elect to remove print duplicates even if they are accessed periodically.

2.6.1 *Removal and disposal of materials*

In many cases, the NRAO Library recycles print materials or places them for a brief time in a community discard location used for the removal of other limited value materials. There are circumstances when the library will contact a worldwide listserv of other physics and astronomy libraries or nearby universities to inquire if they would like duplicates or older editions of titles. It is important to note the reason the NRAO Library is removing the text is because they were not appropriate for the scope of the collection to begin with, or have since been superseded by newer material. This often means other libraries are not interested in acquiring materials removed from the NRAO Library. Occasionally books will be sent to Zupal for resale.

Materials that no longer belong in our collection are placed on a shelf in the third floor mailroom (if appropriate) and staff may choose items of personal interest. In the interest of protecting NRAO from any appearance of waste, fraud, and abuse, the library does not take "orders" for withdrawn materials from staff. If the library has elected to remove material for reasons stated above, staff may take it from the discarded pile, but the library does not set aside materials for staff. If staff believe a text in the discard box is still of interest to the Observatory, it is more appropriate for the library to retain the text and check it to the staff member. Items (up to 20 per patron) circulate for six months at a time, and two, 3-month renewals are permitted by request only, excluding items another patron has on hold. Librarians will recall books after the maximum one-year loan.

3 ACQUISITIONS

3.1 Sources of acquisition

3.1.1 *Direct digital subscriptions*

Direct digital collection/title subscriptions (see Appendix B for complete licensing details. *Appendix B is internal use only*).

SPIE (access to complete Digital Library); Springer (Physics and Astronomy eBook Collection with Lecture Notes); *IEEE (access to very limited subset of titles via master serials contract); IOP eBooks (releases 1-4, <https://iopublishing.org/publications/our-books/>); O'Reilly Learning (supplements most software, data science, technical, and engineering topics for which we buy print on an as-needed basis only with over 50,000 eBooks, videos, self-paced trainings, and live trainings).

3.1.2 *Master serials subscription contracts*

Master Serials Subscription Contract: the majority of journals – both print and electronic – are acquired and invoiced through the master subscription service.

3.1.3 *Review of catalogs and publishers websites*

Review of catalogs and publisher websites – Oxford, Cambridge, Springer, Princeton U Press, Rowman & Littlefield, World Scientific, etc.

3.1.4 *Patron purchase suggestions*

Customer purchase suggestions (see **Purchase Requests** below)

3.2 Gifts

Gifts-in-kind are common and welcome at the NRAO Library, occurring particularly when divisions are physically relocating within the Observatory, or as individual staff members approach retirement. Gifts originating from outside the Observatory are rare, but apply equally under this policy. Adapting the San Jose State University Library policy, all gifts will be subject to the same criteria used for new purchases and should support the missions, research, and technical needs of the Observatory. Recent, non-duplicative content supplementing the Library's collection will be favored, in addition to NRAO publications not already held in duplicate. The Library assumes ownership of all donations and reserves the right to add donated materials to its collections or to exchange or discard them as appropriate. The Library does not accept donated collections that must be kept intact or items offered conditionally, temporarily, or with restrictions. The Library will not provide or arrange for appraisals of the donated items for income tax purposes; however, an acknowledgement letter can be provided to the donor upon request.

3.3 Purchase requests

NRAO staff are welcome to suggest items for purchase that would advance their research, technical, or administrative work. Purchase requests are given serious consideration by library staff and in most cases are fulfilled. On rare occasions, library staff may decline a purchase request due to factors such as budgetary restriction, limited appeal across the Observatory, or format. In such cases, library staff will work with the requestor to identify resources falling under the purview/scope of this policy to meet the requestor's needs. The NRAO Library may elect to use interlibrary loan, resource sharing networks, or UVA to fulfill requests that do not warrant purchase.

3.4 Contact information

National Radio Astronomy Observatory
NRAO Library
520 Edgemont Road
Charlottesville, VA 22903

library@nrao.edu

Lance Utley, Observatory Librarian, lutley@nrao.edu, 434-296-0215

Kristy Davis, Librarian, kdavis@nrao.edu, 434-244-6827

The NRAO Library is located on the 3rd floor of the Edgemont Road Building on the UVA Grounds.

Other libraries with whom we share this policy are welcome to directly copy or adapt the guidance herein.

APPENDICES

NRAO Library subject analysis

BASIC STUDY – disciplines relevant to our activities at the Observatory; foundational topics; we track these disciplines with interest. “...provides resources adequate for imparting and maintaining knowledge about the basic or primary topics of a subject area.” Collections that have historical importance to the Observatory but are no longer being actively acquired are part of this category, e.g., early gender studies in sciences; archeoastronomy.

ADVANCED STUDY – subject professionals are active within these disciplines at the Observatory. “...can support...specialized inquiries such as those of subject professionals within special libraries.”

RESEARCH – original analysis is being generated around these disciplines at the Observatory or these disciplines are utilized in the creation of original analysis. “...required for...independent research...supports doctoral and other original research”

Adapted from:

Anderson, Joanne S. *Guide for Written Collection Policy Statements*. 2nd ed. Chicago, Ill. : American Library Association, 1996.

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| HD69.P75 | Project management ADVANCED STUDY |
| HF5549.5 | Management topics ADVANCED STUDY |
| Q130 | Women in science BASIC STUDY |
| Q147-149 | Science as a profession ADVANCED STUDY |
| Q181-183.4 | Science education ADVANCED STUDY |
| Q223 | Communication in science ADVANCED STUDY |
| QA75-76 | Programming languages, software, and architecture RESEARCH |
| QA76.76 .D47 | Software development and agile methodologies ADVANCED STUDY |
| QA276-280 | Statistics and data analysis RESEARCH |
| QB1 | Periodical, society, congress, and serial publications in astronomy RESEARCH |
| QB6 | Star catalogs RESEARCH |
| QB15-34 | History of astronomy BASIC STUDY |
| QB36 | Astronomer biographies BASIC STUDY |
| QB45-45.2 | Introductory astronomy textbooks BASIC STUDY |
| QB51.3 | Electronic data processing, image systems in astronomy ADVANCED STUDY |
| QB65 | Atlases and charts RESEARCH |
| QB81-117 | Observatories, astronomical instruments RESEARCH |

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| QB121 | Astronomical photography BASIC STUDY |
| QB351-355 | Celestial mechanics RESEARCH |
| QB461-466 | Astrophysics RESEARCH |
| QB468-480 | Non-optical astronomy RESEARCH |
| QB500.268 | Hubble Space Telescope RESEARCH |
| QB500.269 | James Webb Space Telescope RESEARCH |
| QB500.5-785 | Solar system, asteroids, comets RESEARCH |
| QB790-792 | Interstellar matter, cosmic dust, dark energy RESEARCH |
| QB799-843 | Stars, stellar evolution, binary systems, variable stars, stars by type RESEARCH |
| QB820 | Extrasolar planets RESEARCH |
| QB851-855.9 | Clusters and nebulae RESEARCH |
| QB856-858.8 | Galaxies RESEARCH |
| QB870-903 | Stellar spectroscopy RESEARCH |
| QB980-991 | Cosmology RESEARCH |
| QC15-16 | Physicist biographies BASIC STUDY |
| QC21-24.5 | General works, textbooks, popular works in physics BASIC STUDY |
| QC173-174 | Properties of matter, relativity physics, quantum theory and mechanics BASIC STUDY |
| QC178-179 | Theories of gravity, gravitational waves RESEARCH |
| QC350-467 | Optics and light RESEARCH |
| QC450-467 | Spectroscopy RESEARCH |
| QC485-766 | Radiation, electricity and magnetism, plasma physics BASIC STUDY |
| QC770-798 | Nuclear and particle physics, atomic energy, radioactivity BASIC STUDY |
| QH325-326 | Origin of life and exobiology BASIC STUDY |
| T11 | Technical writing ADVANCED STUDY |
| TA168 | Systems engineering ADVANCED STUDY |
| TA330-347 | Engineering mathematics and analysis ADVANCED STUDY |
| TA1501-1820 | Applied optics and photonics RESEARCH |
| TA1630-1650 | Optical data processing RESEARCH |
| TK5102.5 & .9 | Signal processing RESEARCH |
| TK7869-7872 | Electronics apparatus and materials RESEARCH |
| TL787-799 | Astronautics and space travel BASIC STUDY |

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| TL789.85 | Astronaut biographies BASIC STUDY |
| TL1050-1060 | Astrodynamics, flight mechanics, orbital mechanics ADVANCED STUDY |
| TL1065-1080 | Space navigation ADVANCED STUDY |

Core Text List

See separate Core Text document available on the library policy page:

<https://library.nrao.edu/policy.shtml>